US008866013B2

(12) **United States Patent**
Masumoto

(10) **Patent No.: US 8,866,013 B2**
(45) **Date of Patent: Oct. 21, 2014**

(54) **TERMINAL BOX**

(71) Applicant: **Hosiden Corporation**, Yao (JP)

(72) Inventor: **Yutaka Masumoto**, Yao (JP)

(73) Assignee: **Hosiden Corporation**, Osaka (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/231,932**
(22) Filed: **Apr. 1, 2014**

(65) **Prior Publication Data**

US 2014/0209376 A1 Jul. 31, 2014

Related U.S. Application Data

(62) Division of application No. 13/186,862, filed on Jul. 20, 2011, now Pat. No. 8,723,031.

(30) **Foreign Application Priority Data**

Aug. 30, 2010 (JP) 2010-192469
Aug. 30, 2010 (JP) 2010-192470
Aug. 30, 2010 (JP) 2010-192471
Aug. 30, 2010 (JP) 2010-192472

(51) **Int. Cl.**
H05K 5/00 (2006.01)
H02G 3/08 (2006.01)

(52) **U.S. Cl.**
CPC ***H02G 3/08*** (2013.01)
USPC **174/50**; 439/76.1; 136/251; 174/541; 174/60

(58) **Field of Classification Search**
USPC 174/50, 60, 520, 541, 549; 439/76.1, 439/884; 136/251
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,173,643	B1	1/2001	Qian et al.	
6,207,896	B1	3/2001	Toyomura	
6,696,641	B2	2/2004	Sasaoka	
7,928,314	B2	4/2011	Higashikozono et al.	
8,248,804	B2 *	8/2012	Han et al.	361/717
2006/0180196	A1 *	8/2006	Lares et al.	136/251
2008/0115822	A1 *	5/2008	Cunningham et al.	136/244
2008/0190477	A1	8/2008	Hattori	
2009/0260676	A1 *	10/2009	McMahon et al.	136/251
2010/0039781	A1	2/2010	Tai et al.	
2011/0108085	A1	5/2011	Quiter	
2011/0168228	A1	7/2011	McGreevy et al.	
2012/0156946	A1 *	6/2012	Cohen et al.	439/754

FOREIGN PATENT DOCUMENTS

EP	1758176	A1	2/2007
JP	3104755	U	10/1991
JP	1126035	A	1/1999
JP	200051077	A	2/2000
JP	3069523	U	3/2000
JP	2000299485	A	10/2000
JP	200177391	A	3/2001
JP	2003197944	A	7/2003
JP	2006339659	A	12/2006
JP	2008263673	A	10/2008
WO	2009129405	A2	10/2009

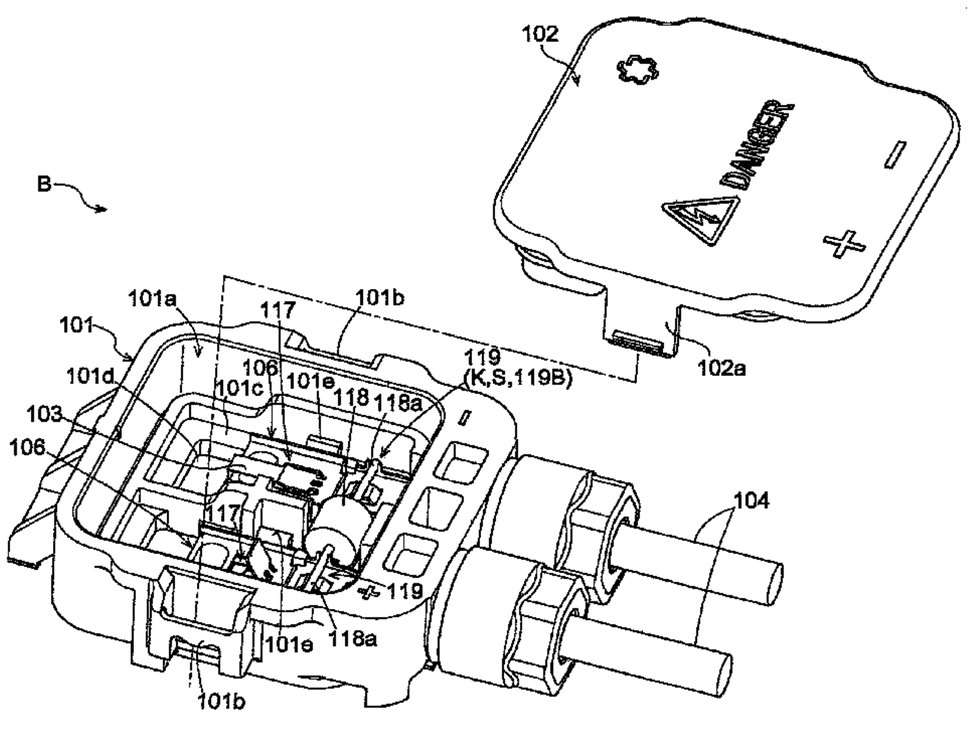
* cited by examiner

Primary Examiner — Hung Ngo
(74) *Attorney, Agent, or Firm* — The Webb Law Firm

(57) **ABSTRACT**

A terminal box includes: a main body (**101**); at least one pair of terminal strips (**106**) which are connectable to a positive electrode and a negative electrode of a solar cell module; and a backflow prevention diode (**118**) bridged between the terminal strips (**106**) to connect the terminal strips (**106**). The terminal strip (**106**) and the backflow prevention diode (**118**) are contained in the main body (**101**). The terminal strip (**106**) includes: a supporting part (S) for supporting a lead wire (**118***a*) of the backflow prevention diode (**118**) in a mounted state; a pinching part (K) for supporting the lead wire (**118***a*) in a pinched state; and a recess (**119**B) which is provided between the supporting part (S) and the pinching part (K) and configured to position a connecting solder upon connecting the lead wire (**118***a*) and the terminal strip (**106**).

2 Claims, 12 Drawing Sheets



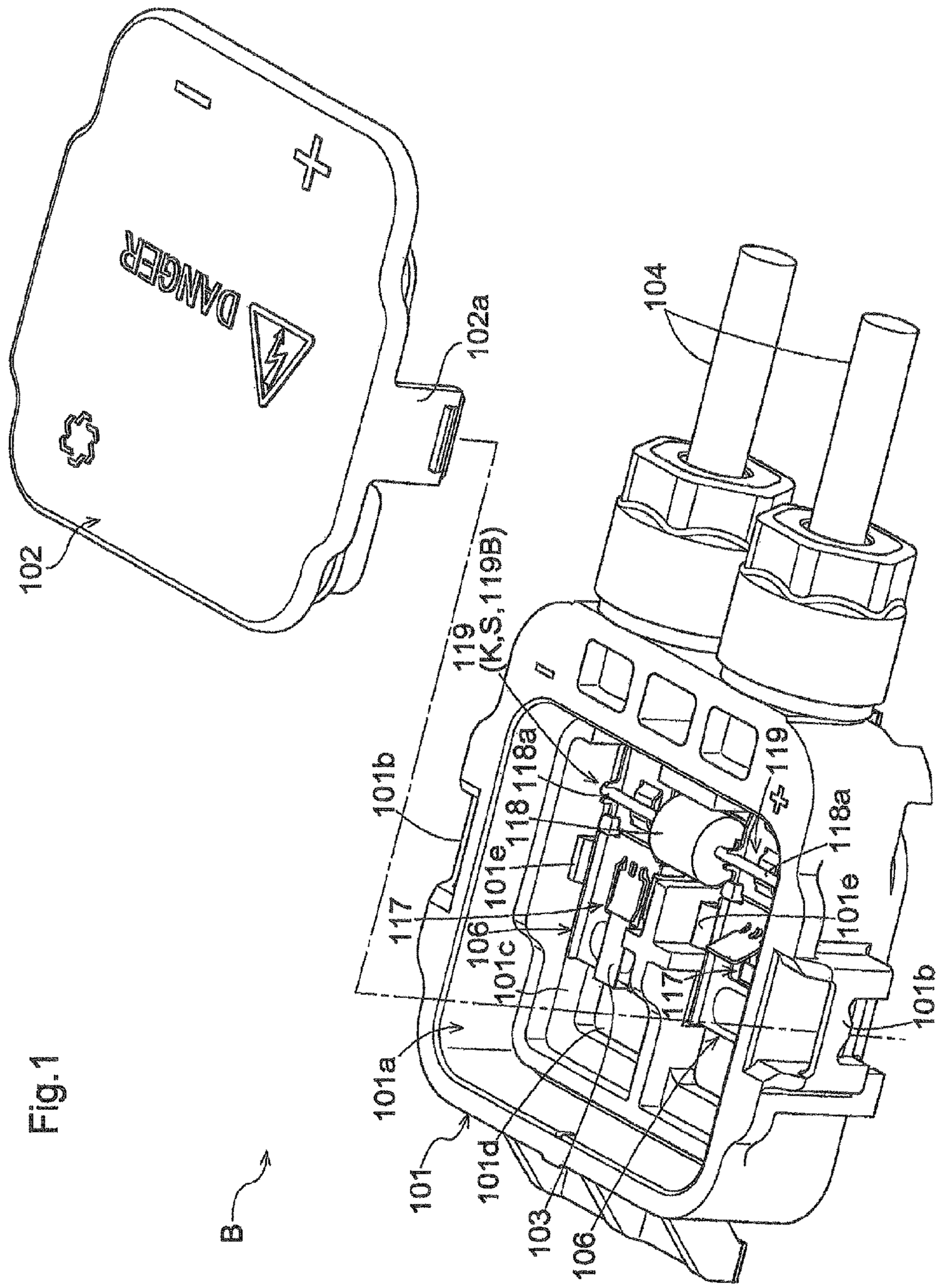

DANGER
102
102a
104
119 (K,S,119B)
101b
118 118a
119
118a
101e
117
106
101c
101a
101
101d
103
106
B

Fig.1

Fig.2

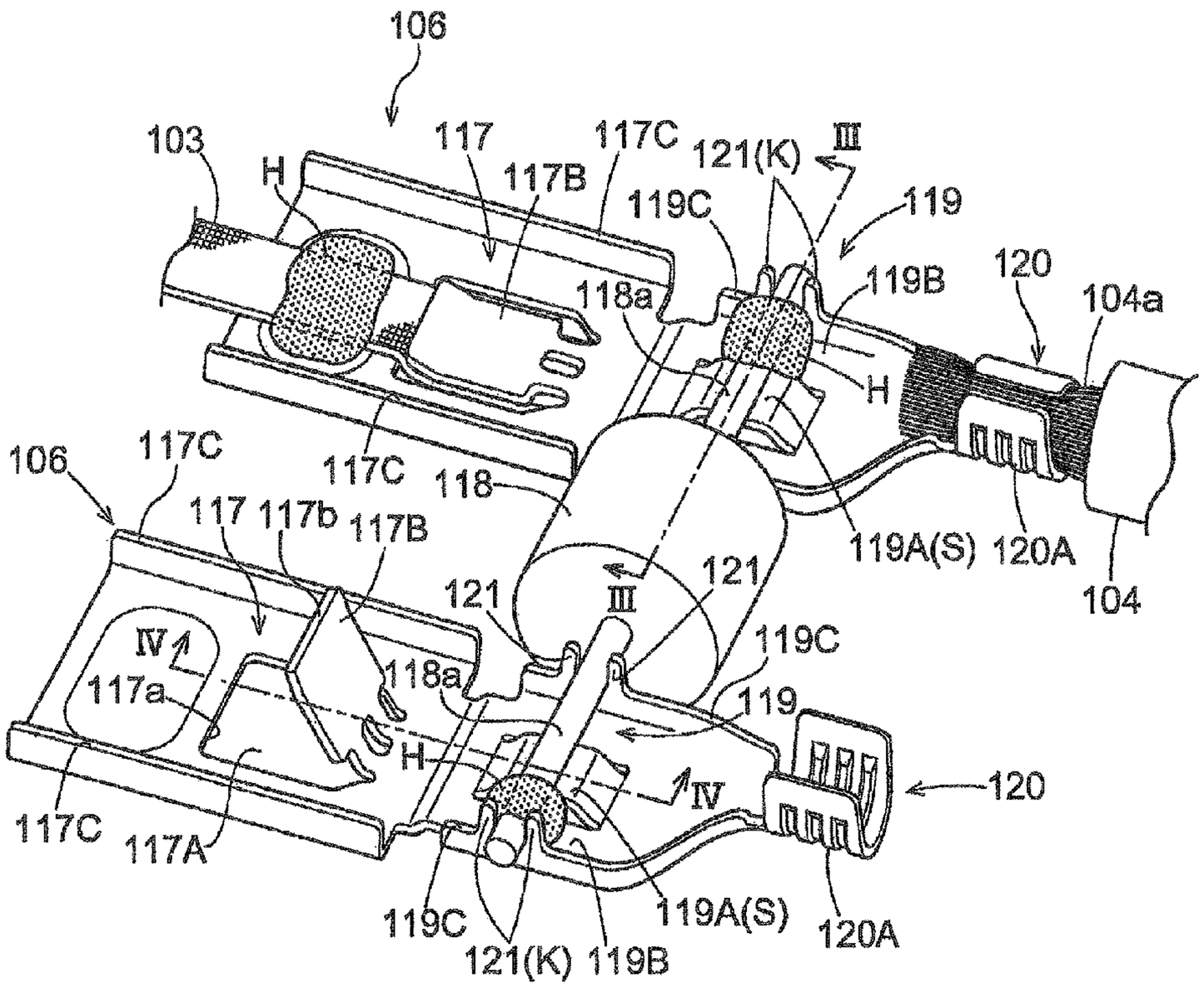

106
103
117
117C
121(K)
III
H
117B
119C
119
119B
120
104a
118a
H
117C
106
117C
117
117b
117B
118
119A(S)
120A
104
121
III
121
IV
119C
118a
117a
119
H
IV
120
117C
117A
119C
119A(S)
120A
121(K)
119B

Fig.3

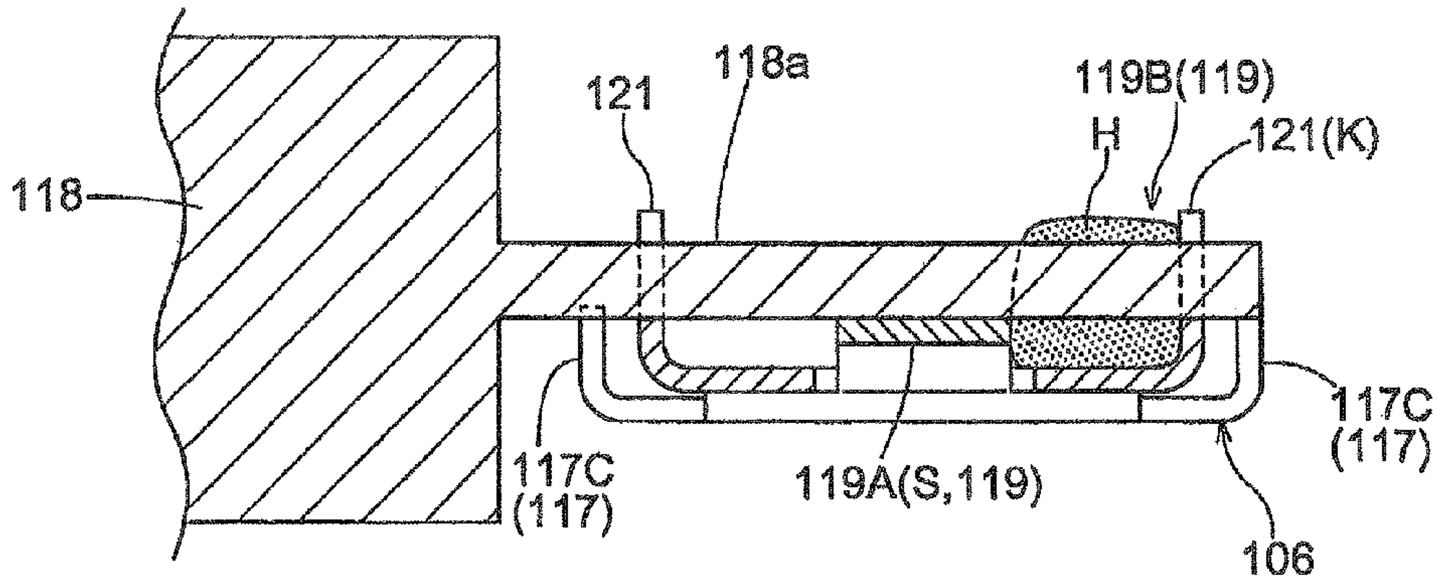
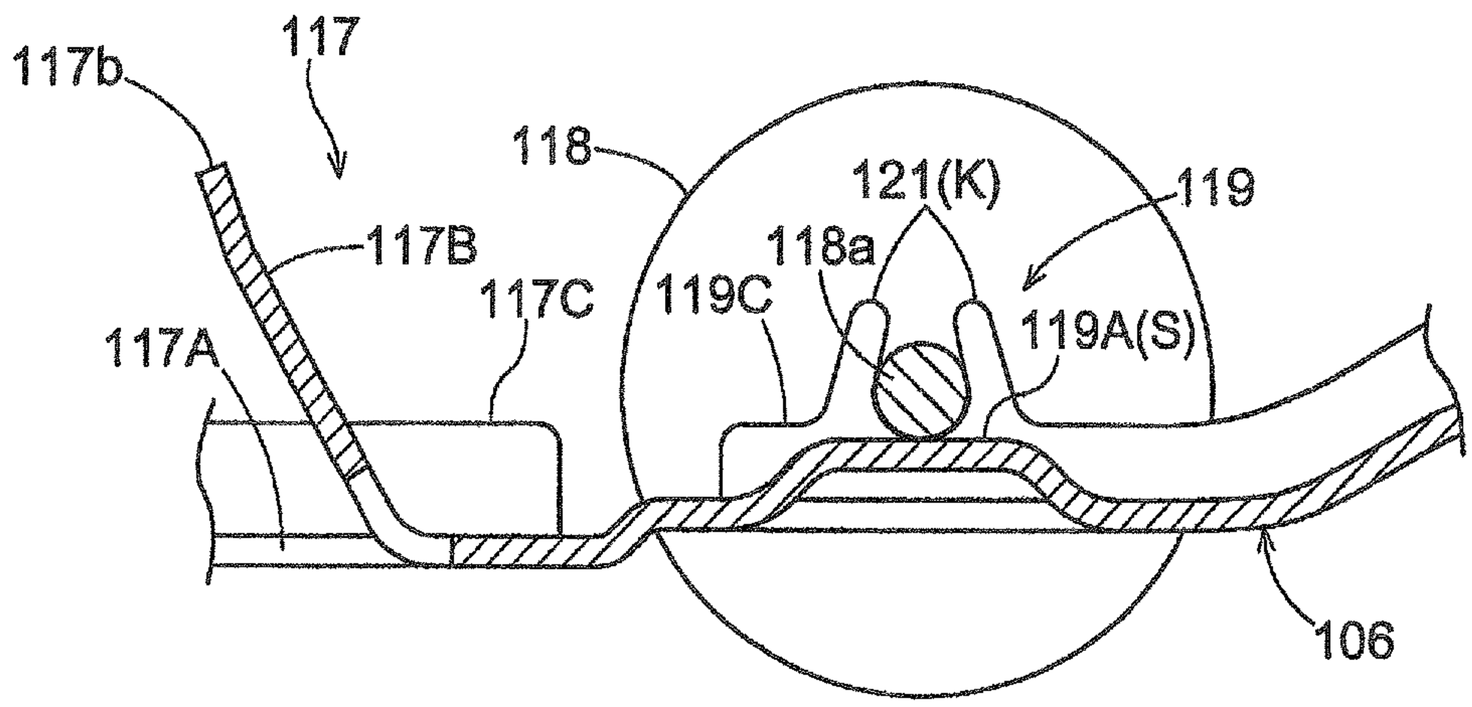

118a
121
119B(119)
H
121(K)
118
117C
(117)
119A(S,119)
117C
(117)
106

Fig.4



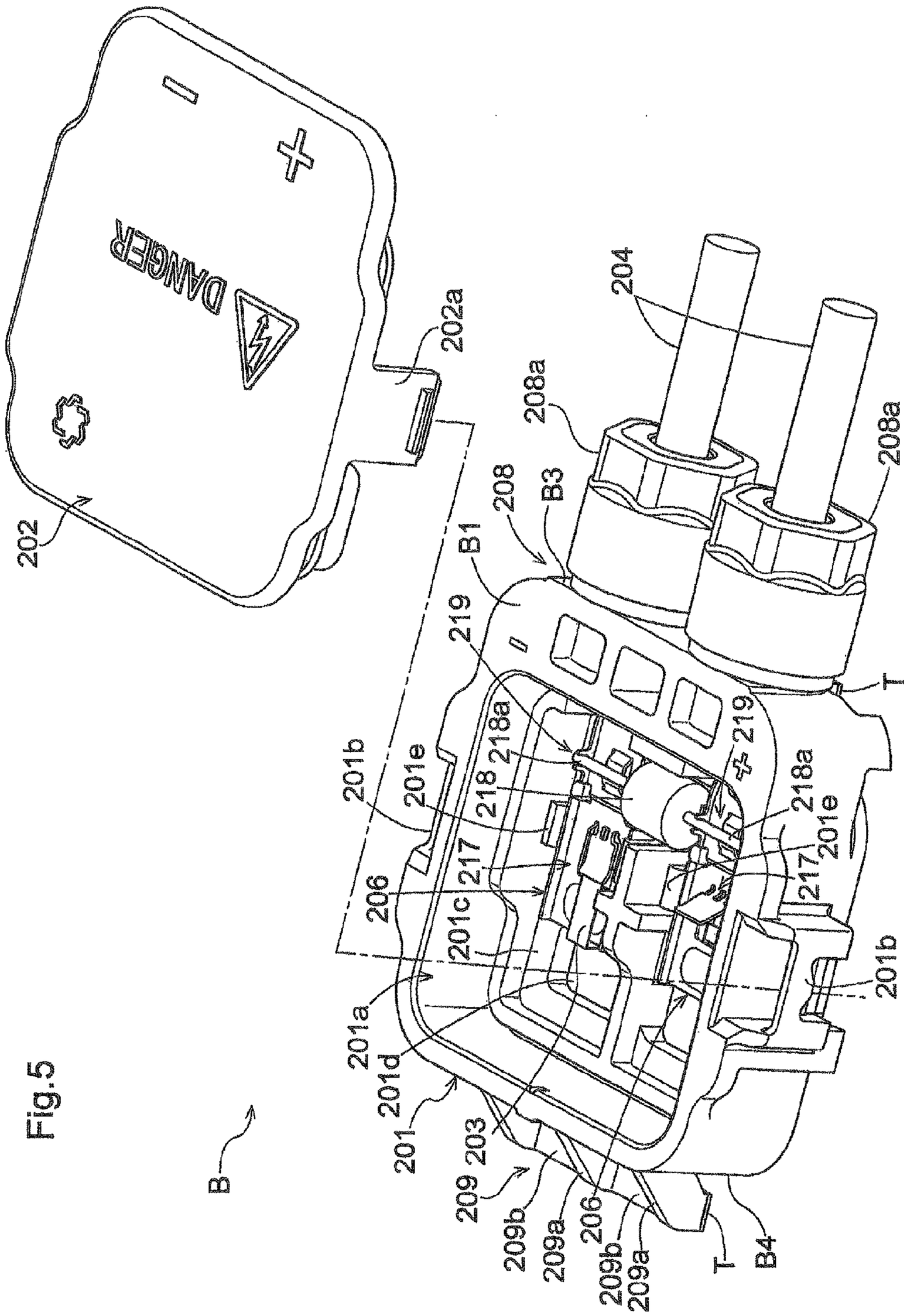

DANGER
202
202a
204
208a
208
B3
B1
219
218a
218
217
201e
201b
201c
201a
201d
201
203
209
209b
209a
206
T
B4
B

Fig.5

Fig.6

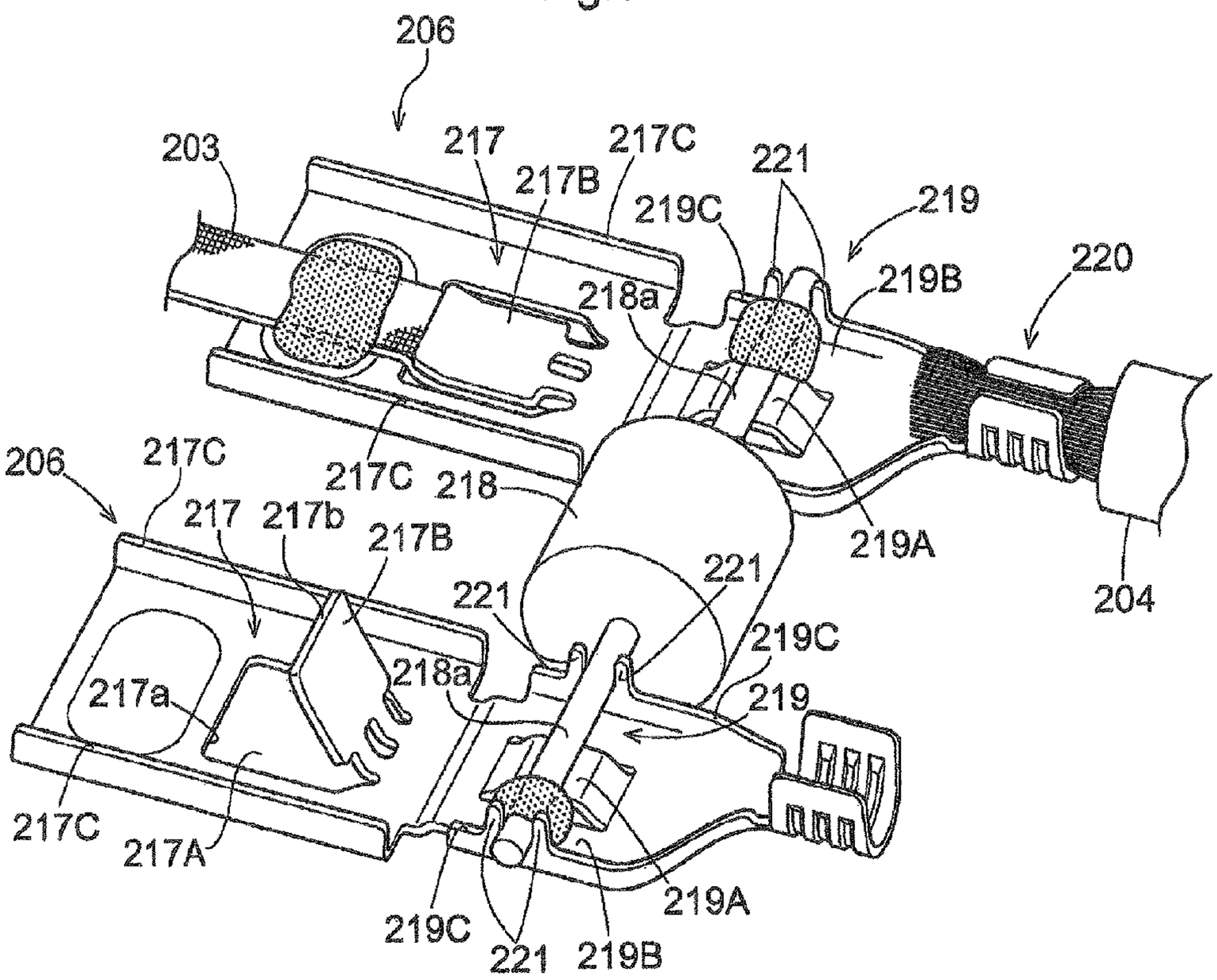

206
203
217
217C
217B
219C
221
219
220
219B
218a
206
217C
217
217b
217B
217C
218
219A
221
221
219C
218a
217a
219
217C
217A
219A
219C
221
219B
204

Fig.7

201b
201d
208
208a
209
204
B3
T(209b)
B4
201d
207
T
208a
204
201b
B2

Fig.8

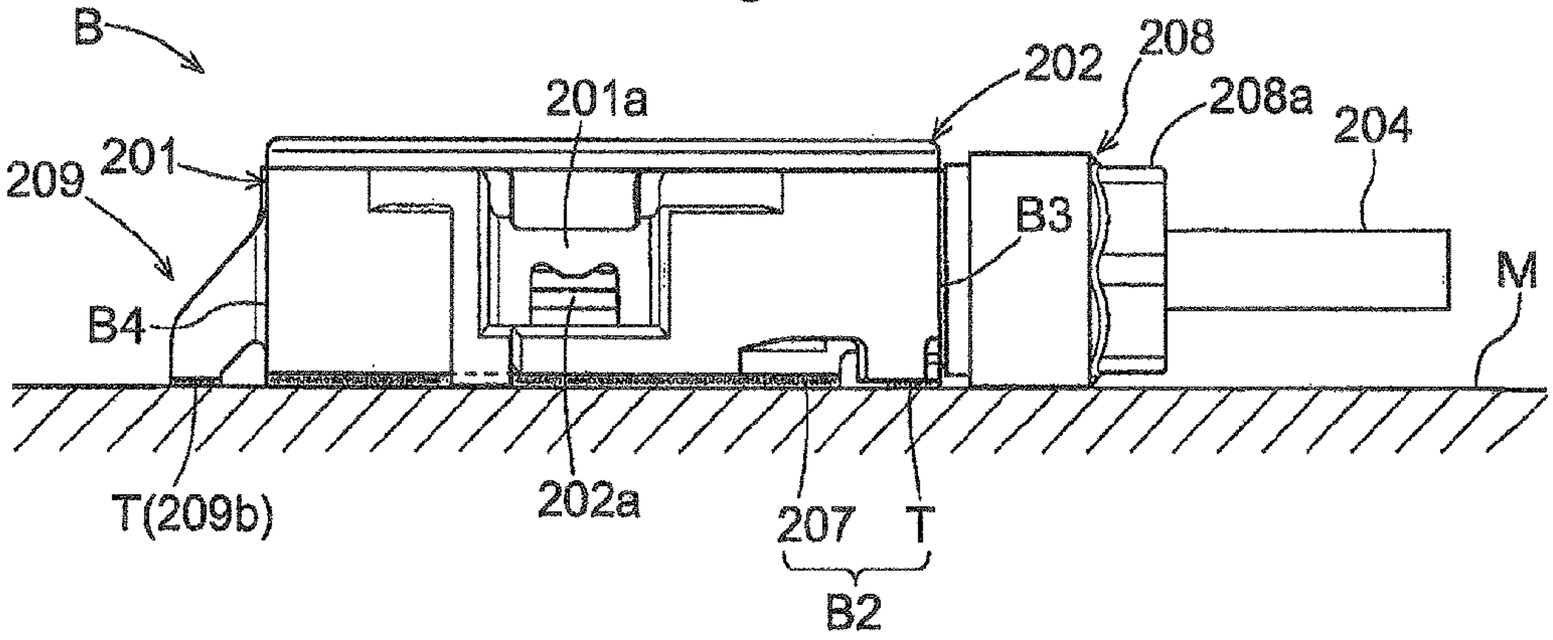


Fig.9A

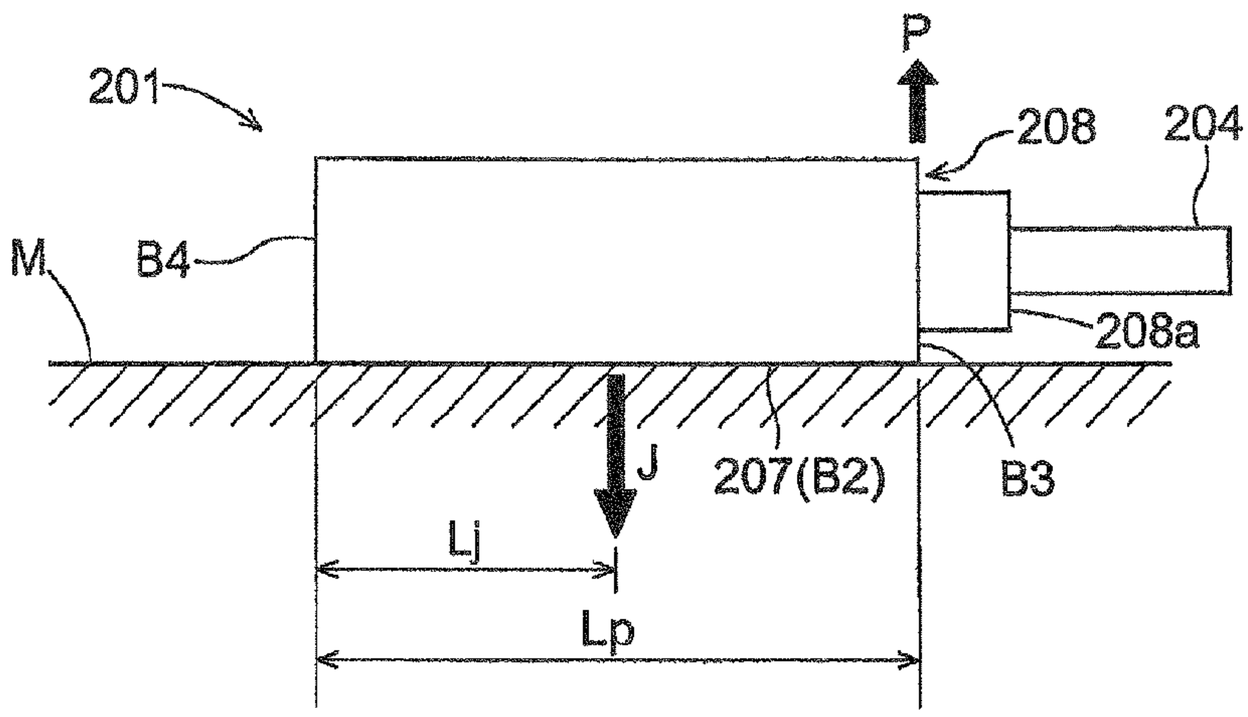
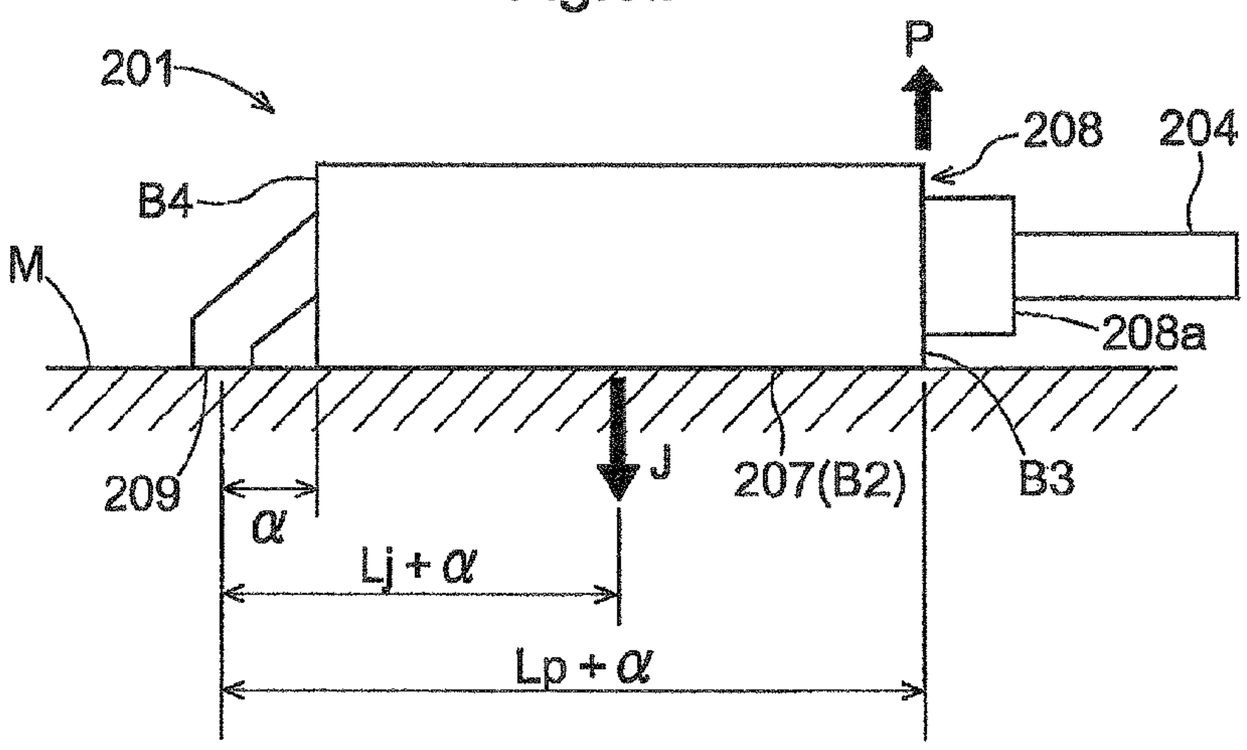


Fig.9B



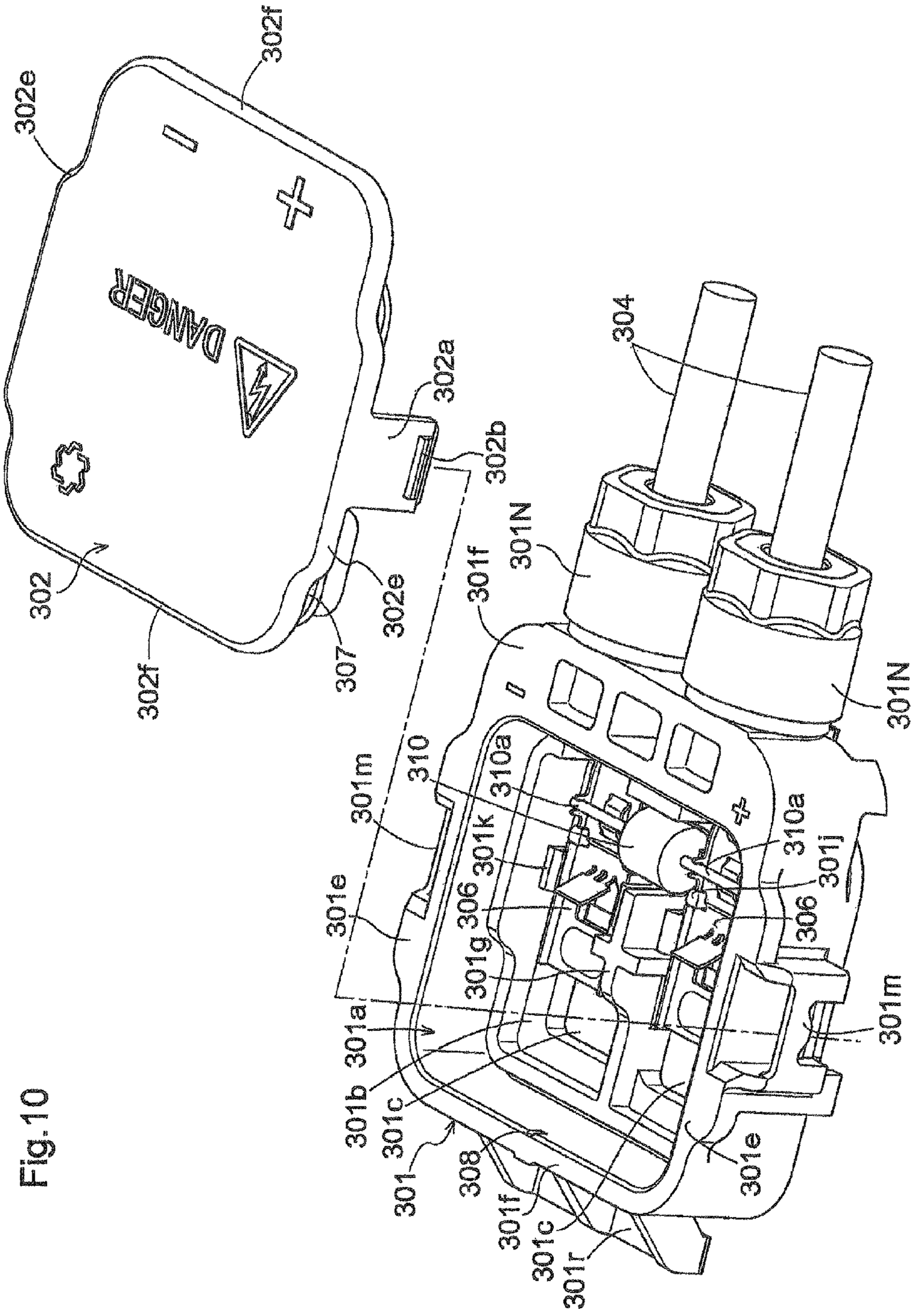

302e
302f
DANGER
302
302f
307
302e
302a
302b
304
301N
301f
301N
310
301m
310a
301k
306
301e
301g
301a
301b
301c
301
308
301f
301c
301r
310a
301j
306
301m
301e

Fig.10

Fig.11

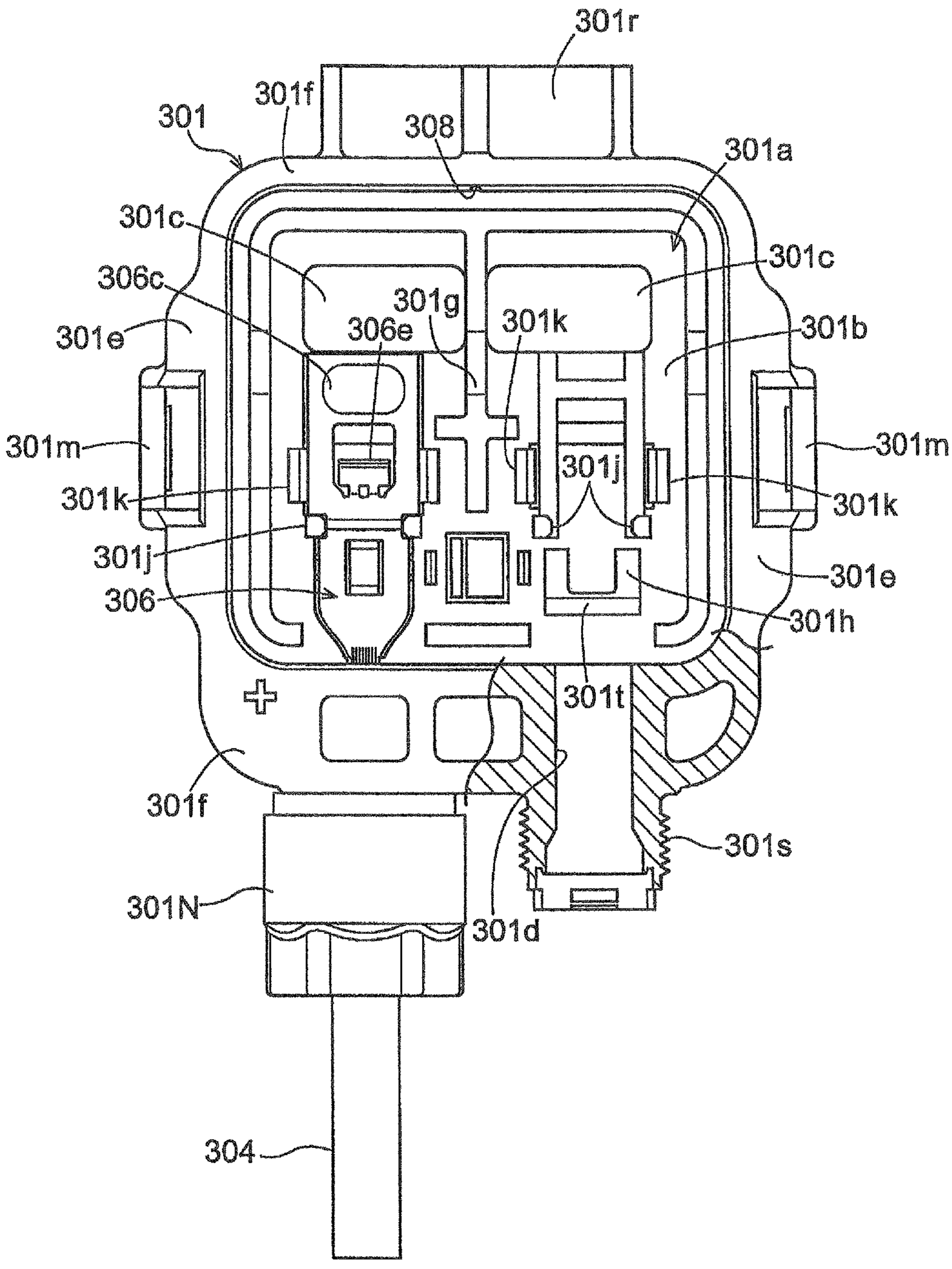
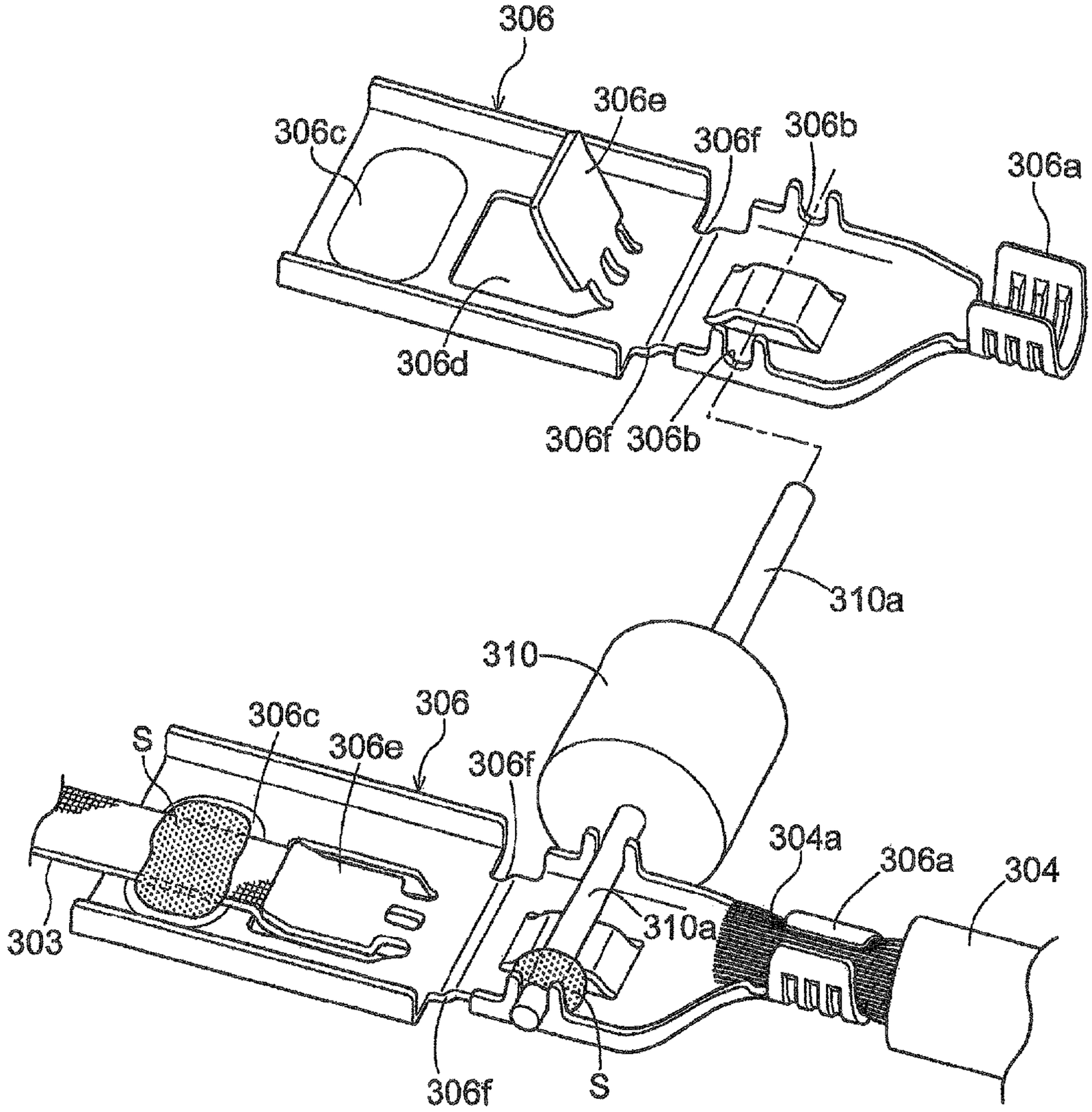

301r
301f
301
308
301a
301c
306c
301g
301k
306e
301e
301b
301m
301m
301k
301j
301k
301j
306
301e
301h
301t
301f
301s
301N
301d
304

Fig. 12


306
306c
306e
306f
306b
306a
306d
306f 306b
310a
310
306c
306
306e
306f
S
304a
306a
304
310a
303
306f
S

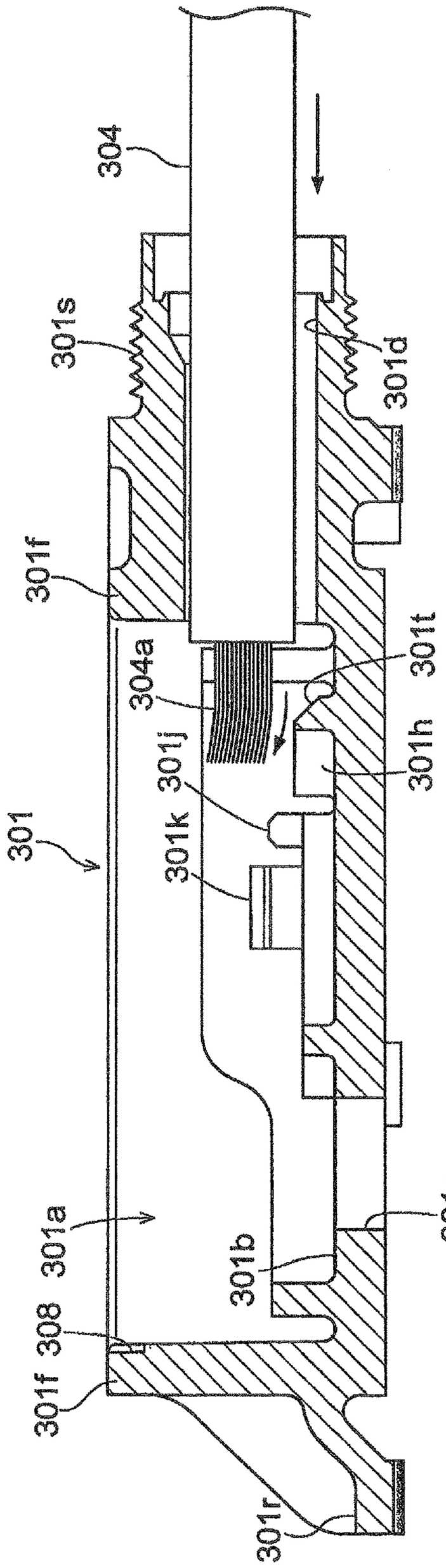

304
301s
301d
301f
304a
301t
301j
301h
301k
301
301a
301b
301c
308
301f
301r

Fig.13

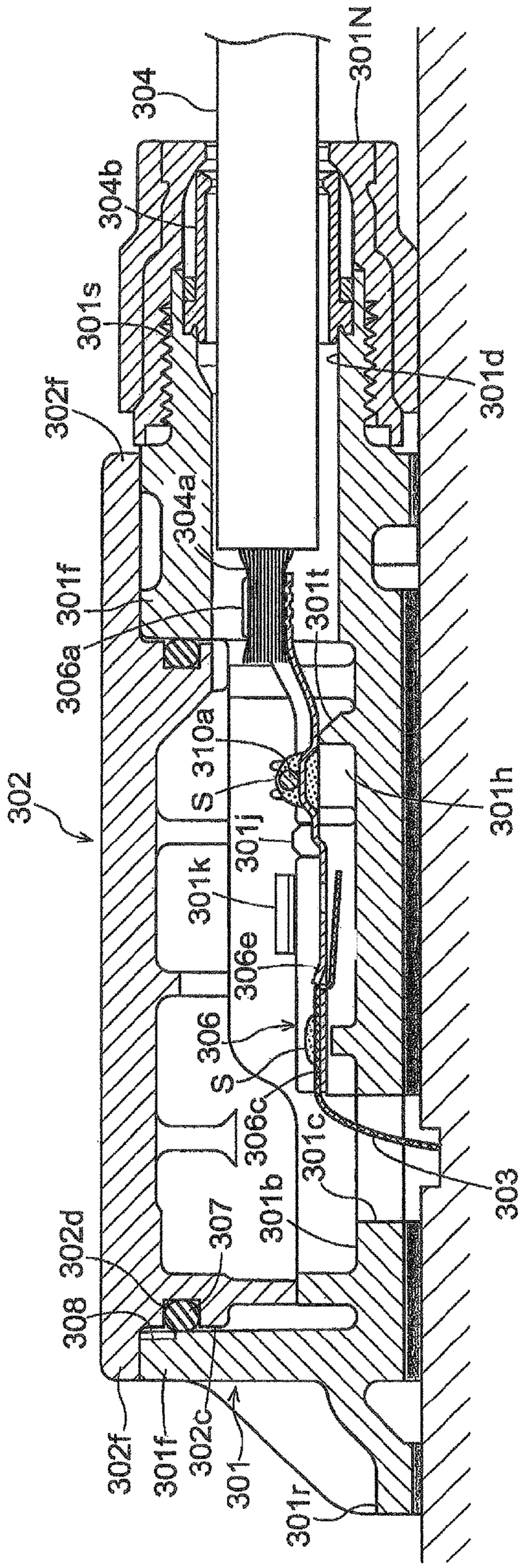

304
301N
304b
301s
302f
301d
304a
306a
301f
301t
302
S 310a
301h
301k
301j
306e
S 306
306c
301c
303
307
301b
302d
308
302f
301f
302c
301
301r

Fig.14

Fig.15A

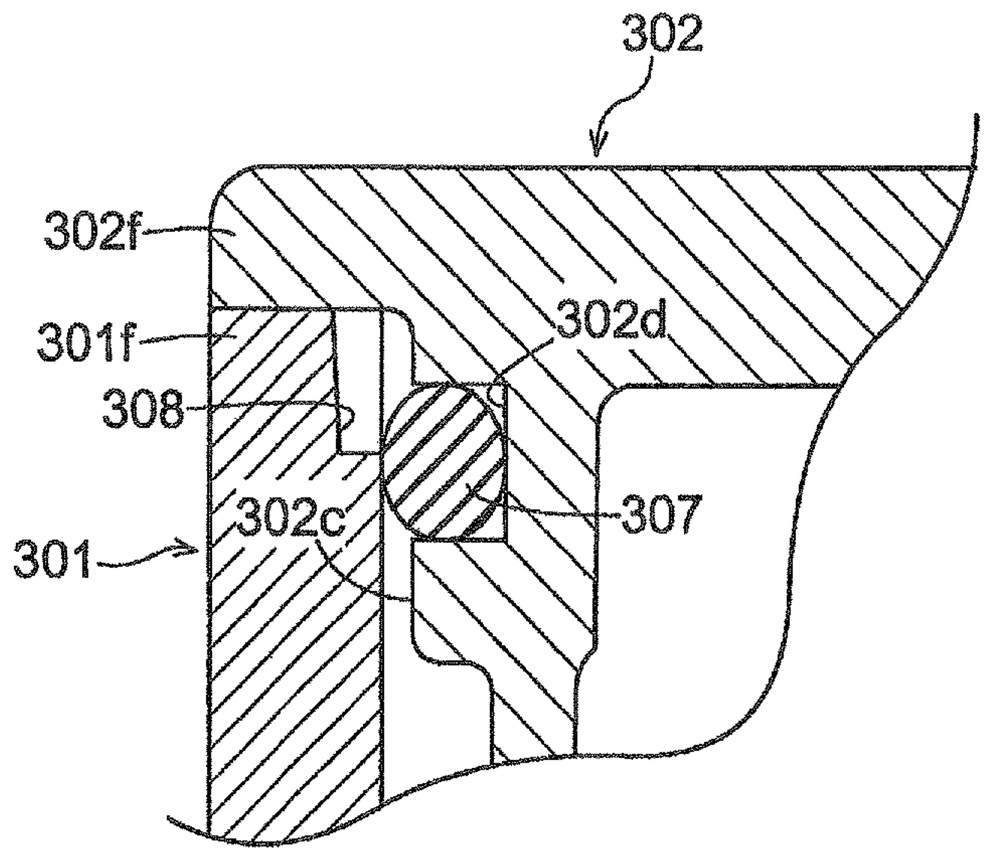
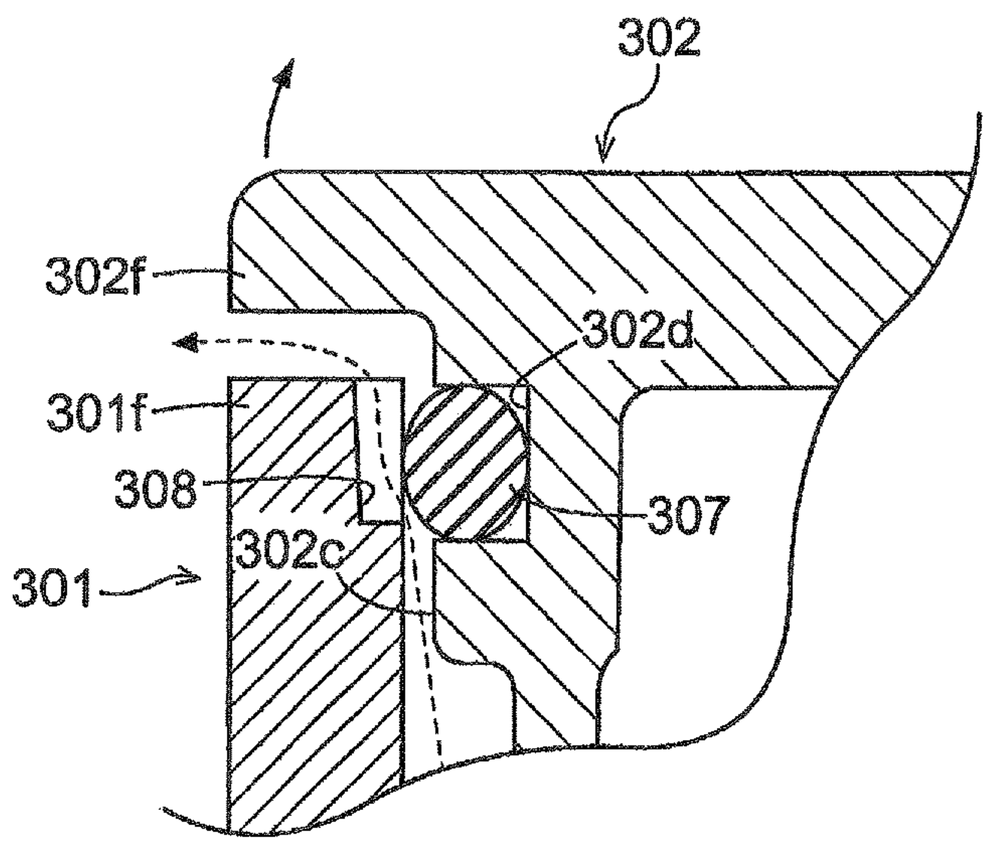


Fig.15B



TERMINAL BOX

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a division of U.S. application Ser. No, 13/186,862, filed Jul. 20, 2011, which claims the benefit of Japanese Application Nos. 2010-192469, 2010-192470, 2010-192471, and 2010-192472, all of which were filed on Aug. 30, 2010. The disclosure of each of these documents is hereby incorporated by reference in its entirety.

BACKGROUND

1. Field of the Invention

The present invention relates to a terminal box used for a solar cell module.

2. Description of the Related Art

A conventional terminal box includes a main body containing: at least one pair of terminal strips which are connectable to a positive electrode and a negative electrode of a solar cell module; and a backflow prevention diode bridged between the terminal strips to connect the terminal strips. In this type of the terminal box, a. pair of the planar terminal strips are arranged in parallel at a distance, the backflow prevention diode is bridged between the terminal strips in such a manner that a lead wire of the backflow prevention diode is placed across a full width of the corresponding terminal strip, and the lead wire is soldered (see, for example, Japanese Utility Model Registration No. 3069523).

In the conventional terminal box described above, the lead wire of the backflow prevention diode is soldered while the lead wire is placed on the planar terminal strip, and thus the solder is likely to spread to other parts along a plane of the terminal strip, and heat of the spread solder may involve a risk of an adverse influence on other parts (e.g. devices). In addition, if the solder spreads to other parts and an amount of the solder becomes insufficient for an essential portion of the lead wire, there is a risk of lowering in a fixing strength.

In other words, there is a problem that fixing of the backflow prevention diode is likely to become unstable.

Another conventional terminal box includes: at least one pair of terminal parts which are provided in a main body and connectable to a positive electrode and a negative electrode of a solar cell module; at least one pair of connection parts which are provided on one lateral face of the main body and each of which is configured to conductively connect an external cable to the terminal part; and an adhesive surface which is provided on a rear face of the main body and adhesive to the solar cell module. In this type of the terminal box, the main body has a cuboid shape, one of whose four lateral faces is provided with a connection part, with each of the other three lateral faces being in a shape of a planar wall (see, for example, Japanese Unexamined Patent Application Publication No. 2006-339659). In addition, a rear face as bottom of the main body is configured so that an entire surface constitutes an adhesive surface to which an adhesive is applied.

In the conventional terminal box described above, if an external force acts on an external cable connected to the connection part in a direction to remove the terminal box from an attaching face of the solar cell module (hereinbelow, referred to as "removing direction"), there may be cases where the adhesive surface is peeled off and the terminal box is detached. A relationship between an external force P and an adhesive force (resultant force) J in this case is represented in the drawing of FIG. **9**A. Specifically, on a connection part **208** provided on one lateral face B**3** of a main body **201**, the external force P in the removing direction acts, and on an adhesive surface **207**, the adhesive force J acts as a drag. Since the external force P and the adhesive force J are different in their point of actions, these forces act as a couple of forces. As a result, a rotational moment in which the other lateral face B**4** of the main body **201** serves as a rotational center acts on the main body **201**.

The reference character "Lp" in the drawing indicates a distance from the rotational center to a point on which the external force P acts. The reference character "Lj" in the drawing indicates a distance from the rotational center to a point on which the adhesive force J acts. The following relationship is obtained: Lp=(Lj×2).

Therefore, in order to prevent the terminal box from being removed which may otherwise be caused by the action of the external force P, a balancing relational expression of (Lj×J)> (Lp×P) should be met. In other words, an adhesive material should be upgraded to one with a higher adhesion strength.

For a terminal box in which a bottom wall of a main body is provided with a terminal strip to which an output terminal of a solar cell module and a core of a power cable are connected, Japanese Unexamined Patent Application Publication No. 11-26035 describes that the terminal strip is disposed inside the main body, the power cable (output cable in the document) is inserted into the main body and the core of the power cable is swaged by a swaging part of the terminal strip, to thereby electrically connect the power cable and the terminal strip. The document also describes that a lead wire of a bypass diode is soldered to a projection piece of each of a pair of the terminal strips, and the output terminal (lead wire in the document) of the solar cell module is soldered to a leg part of the terminal strip.

Japanese Unexamined Patent Application Publication No. 11-26035 further describes that an engaging hole is formed in the terminal strip, an engaging projection of the main body is inserted into the engaging hole so that the engaging projection protrudes from the engaging hole, and the protruding portion is melted using ultrasonic wave to make a diameter larger and then cured, to thereby fix the terminal strip to the bottom wall of the main body.

As described above, the terminal box used for the solar cell module requires works to connect the output terminal of the solar cell module and the power cable to the terminal strip, when the solar cell module is installed. As a result, more efforts are required, and thus improvement in workability has been demanded.

Considering a mode of work upon inserting the power cable into the main body, a coating of the power cable is removed to expose the core which is then inserted into a hole or the like of the main body. Since thin wire rods are used for the core, they are likely to be bent. Consequently, when the core is inserted into a hole or the like, the core frequently comes into contact with a wall face inside the main body, a rib or the like, and a smooth insertion is hindered. Especially, when the core comes into contact with an interior of the main body, there may be cases where a bundle of the wire rods spread (unravel), and thus there is a room for improvement.

For a terminal box including: a main body containing a terminal strip configured to electrically connect an output terminal of a solar cell module and a power cable; and a lid for closing an opening of the main body, Japanese

Unexamined Patent Application Publication No. 2003-197944 describes a configuration in which a terminal strip (electrode connection terminal in the document) is provided on a bottom wall of a main body (terminal box in the document), a lid is provided for closing an opening of the main body, a sealing groove is formed along a peripheral wall

surrounding the opening of the main body, and a sealing member is provided in the sealing groove.

Japanese Unexamined Patent Application Publication No. 2003-197944 describes a configuration in which a mounting part for lid as an engagement recess is formed in the peripheral wall surrounding the opening of the main body, while the lid is provided with an engagement projection. Due to this configuration, when the opening of the main body is closed with the lid, the engagement projection of the lid engages with the engagement recess of the mounting part and a closed state is retained. At the same time, the sealing member is brought into contact with an inner face of the lid to create a sealed state. When this lid is removed, maintenance and inspection, or repair of failures, can be performed.

Japanese Unexamined Patent Application Publication No. 2003-197944 also describes a configuration in which, while the power cable (connection cable in the document) is inserted into the main body, the lid is attached to the main body, and the core of the power cable is brought into contact with the terminal strip by a pressure of a pressing part of the lid.

As described in Japanese Unexamined Patent Application Publication No. 2003-197944, the terminal box is often used in a state in which it is brought into close contact with a rear face or the like of the solar cell module, and for the purpose of preventing rain water and dust from entering the terminal box, a high sealability is demanded in the closed lid. In addition, for maintenance and inspection or repair of failures, the lid should be removed.

However, as described in Japanese Unexamined Patent Application Publication No. 2003-197944, in the case of the terminal box in which the lid is completely fitted with the main body to keep the closed state, when an internal pressure of the main body is increased, for example, along with the temperature increase, it becomes difficult to discharge air inside. Accordingly, the terminal box or the lid may be deformed.

An object of the present invention is to provide a terminal box that solves the above-mentioned problems and ensures the fixing of the backflow prevention diode to the terminal strip.

Another object of the present invention is to provide a terminal box that solves the above-mentioned problems and is unlikely to be removed without using an upgraded adhesive material.

Still another object of the present invention is to provide a reasonably configured terminal box in which work of connecting the power cable to the terminal strip is facilitated.

A further object of the present invention is to reasonably configure a terminal box in which the internal pressure of the main body can be released while the sealability of the main body is retained.

SUMMARY OF THE INVENTION

An aspect of the present invention lies in that a terminal box includes: a main body; at least one pair of terminal strips which are connectable to a positive electrode and a negative electrode of a solar cell module; and a backflow prevention diode bridged between the terminal strips to connect the terminal strips; wherein the terminal strips and the backflow prevention diode are contained in the main body, and the terminal strip includes: a supporting part for supporting a lead wire of the backflow prevention diode in a mounted state; a pinching part for supporting the lead wire in a pinched state; and a recess which is provided between the supporting part and the pinching part and configured to position a connecting solder upon connecting the lead wire and the terminal strip.

According to this aspect of the present invention, since a recess is provided on the terminal strip, the solder can be easily positioned around the recess on the terminal strip. Therefore, unlike the conventional technique, the solder is unlikely to spread to other parts, and heat of the solder is prevented from giving an adverse influence on other parts (e.g. devices) or lowering in the fixing strength of the backflow prevention diode. Therefore, the soldering can be securely performed even though an amount of the solder is small. In addition, the lead wire of the backflow prevention diode is supported in a mounted state by the supporting part of the terminal strip, pinched by the pinching part, and fixed by the solder whose position is determined by the recess as described above. Therefore, the lead wire can be securely fixed, as compared with the conventional terminal box.

Another aspect of the present invention lies in that the terminal strip is formed of a metal plate, the supporting part is formed of a protruding part which protrudes from a part of a face of the terminal strip, and the pinching part is formed of a pair of cut and raised parts each formed by cutting and raising an edge part of the terminal strip.

According to this aspect of the present invention, while achieving the effects as described above, the specific configuration described above does not require special parts and can be achieved by a simple processing on the single terminal strip. As a result, production costs can be reduced.

Still another aspect of the present invention lies in that a terminal box includes: a main body; at least one pair of terminal parts which are provided in the main body and connectable to a positive electrode and a negative electrode of a solar cell module; at least one pair of connection parts which are provided on a first lateral face of the main body and configured to conductively connect an external cable to the terminal part; and an adhesive surface which is provided on a rear face of the main body and adhesive to the solar cell module, wherein a reinforcing rib is provided on a second lateral face on an opposite side of the main body to the connection part, the reinforcing rib jutting out and having a contacting part that comes into contact with a surface of the solar cell module when installed.

According to this aspect of the present invention, the second lateral face which is on the opposite side to the connection part is provided with the reinforcing rib jutting out and having the contacting part which comes into contact with the surface of the solar cell module when installed. The reinforcing rib can serve as a strength member together with the main body, and at the same time, as shown in FIG. **9**B, a position of the rotational center can be moved to a side where a reinforcing rib **209** protrudes, when the external force in the removing direction acts on the connection part **208**. As a result, with the proviso that a displaced amount of the rotational center is a, the balancing relational expression in the present invention becomes $\{(Lj+\alpha)\times J\}>\{(Lp+\alpha)\times P\}$. This means that a rate of increase is larger in a rotational moment by the adhesive force (left side of the balancing relational expression), than in a rotational moment by the external force P (right side of the balancing relational expression) To put it another way, this means that, when an adhesive material with the same adhesion strength is used, the terminal box of the present invention becomes more unlikely to be removed.

For convenience of easy understanding of the relationship, the description will be made by substituting constants for respective variables in the balancing relational expression. With the proviso that Lp=2, U=1, and α=1, the required adhesive force J will be obtained below for each of the con-

ventional balancing relational expression and the balancing relational expression according to the present invention.

In the conventional case, since (Lj×J)>(Lp×P) becomes (1×J)>(2×P), the following relationship is obtained: J>2×P.

In the case of the present invention, since {(Lj+α)×J}>{(Lp+α)×P} becomes {(1+1)×J}>{(2+1)×P}, the following relationship is obtained: (2×J)>(3×P), i.e. J>1.5×P.

Simply put, under the calculation conditions described above, in the conventional case, the required adhesive force J is twice or more as large as the external force P, while in the present invention, the required adhesive force J is 1.5 times or more as large as the external force P. This means that when an adhesive material with the same adhesion strength is used, the terminal box of the present invention is less likely to be removed as compared with the conventional terminal box.

A further aspect of the present invention lies in that the contacting part of the reinforcing rib is formed at a distance from the adhesive surface of the main body.

According to this aspect of the present invention, when the adhesive material is provided on the adhesive surface of the main body, the adhesive can be provided exclusively on the adhesive surface. Accordingly, efficiency of the installation work of the adhesive material can be improved. In other words, when, for example, the adhesive material applicable to the object is used, it is not necessary to pay meticulous attention in such a manner that the adhesive material is applied only to the adhesive surface but not to the reinforcing rib.

As a result, the application work of the adhesive material can be performed simply and efficiently.

A still further aspect of the present invention lies in that a double-stick tape adhesive to the surface of the solar cell module is attached to the contacting part of the reinforcing rib.

According to this aspect of the present invention, until the adhesive material provided between the solar cell module and the main body exerts satisfactory adhesion strength, a positional shift of the main body on the solar cell module can be prevented by the double-stick tape. As a result, properties of the adhesive material are fully exerted and the terminal box can be further securely fixed to the solar cell module.

Another aspect of the present invention lies in that a terminal box includes: a main body; and a terminal strip provided on a bottom wall of the main body, to which an output terminal of a solar cell module and a core of a power cable are connected, wherein the main body has a terminal block protruding from the bottom wall, the terminal strip is provided on the terminal block, the main body is provided with an insertion hole into which the power cable is inserted toward the terminal strip, and the terminal block is provided with an inclined face which is brought into contact with an end part of the power cable and guides the end part in a direction away from the bottom wall when the power cable is inserted into the insertion hole.

According to this aspect of the present invention, when the power cable is inserted into the main body, the end part of the power cable comes into contact with the inclined face and the end part of the power cable can be guided in a direction in which the end part is raised from the bottom wall. With this configuration, even when a coating of the end part of the power cable is removed to expose the core, the work of leading the power cable into the main body and electrically connecting the core to the terminal strip is facilitated, while inconvenience of spreading the core bundle can be suppressed. As a result, the terminal box can be reasonably configured in which the work for connecting the power cable to the terminal strip is facilitated.

In the present invention, the insertion hole may be formed at a higher level than a level of the bottom wall as measured from the bottom wall, the terminal block may be provided with a support face configured to be brought into contact with the terminal strip, and the inclined face may span a region between a vicinity of the bottom wall and the support face.

According to this configuration, by simply inserting the power cable into the insertion hole, even when the distal end part of the power cable is oriented toward the bottom wall, the distal end part of the power cable can be brought into contact with the inclined face and the end part of the power cable can be reasonably guided.

In the present invention, the terminal box may further include a lid, the main body may have an opening at a position opposite to the bottom wall, the lid may be configured to close the opening, and the terminal strip may be removably held in engagement with the terminal block.

According to this configuration, when the lid is opened and the distal end part of the power cable is inserted into the insertion hole, the power cable guided toward the opening by the inclined face can be easily led into the main body. Next, the core on the end part of the power cable is electrically connected to the terminal strip which is removed from the terminal block. Upon this connection, since the terminal strip is separate from the terminal block, work can be easily performed. After this connection, work can be easily performed in which the terminal strip is held in engagement with the terminal block and the opening is closed with the lid.

Still another aspect of the present invention lies in that a terminal box includes: a main body having an opening; a terminal strip which is provided in the main body and configured to electrically connect an output terminal of a solar cell module and a power cable; and a lid configured to close the opening of the main body, the terminal box further including: a groove-shaped air vent which is formed in an inner wall face at the opening of the main body and extends from inside the main body to an opening edge of the opening; a projecting wall part which is formed on an inner face side of the lid and configured to be fitted in the opening; an annular sealing member supported on an outer periphery of the projecting wall part; and a retention mechanism configured to retain the lid at a closed position, wherein when the lid is retained at the closed position by the retention mechanism, the sealing member is brought into contact with a part of the inner wall face of the opening which part is located on a bottom wall side of the main body relative to the air vent, and when the lid is displaced in a direction away from the opening against a retaining force of the retention mechanism due to an increase of an internal pressure, the sealing member reaches a position where the sealing member overlaps the air vent through which air is allowed to be discharged.

According to this aspect of the present invention, when the lid is retained at the closed position by the retention mechanism, the sealing member supported on the lid is brought into contact with all circumference of the inner wall face of the opening of the main body. Accordingly, an excellent sealing condition can be attained. In addition, when the lid is retained at the closed position and the internal pressure of the main body is increased, a part or whole of the lid is displaced outward against a retaining force of the retention mechanism. In this case, when the sealing member reaches a position of the air vent, air inside the main body is discharged outside from the air vent. Therefore, the reasonably configured terminal box is obtained in which the internal pressure of the main body can be released while the sealability of the main body is retained.

In the present invention, the opening is in a rectangular shape, the lid is in a rectangular shape having a pair of longitudinal sides and a pair of transversal sides, the retention mechanisms are provided for connecting either a pair of the longitudinal sides or a pair of the transversal sides to the main body, and the air vent is formed in the inner wall face of the opening facing the side of the lid which is not retained by the retention mechanism, from among the longitudinal sides and the transversal sides.

According to this configuration, the opposing sides of the rectangular lid are retained to the main body by the retention mechanisms, and when the internal pressure of the main body is increased, the sides of the lid which are not retained by the retention mechanisms, from among the transversal sides and the longitudinal sides, are allowed to elastically deform outward. By allowing the elastic deformation in this manner, air inside can be discharged, and after this discharge, the lid in a state of elastic deformation resumes its original shape, and thus a sealing state by the sealing member can be maintained.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an exploded perspective view showing a terminal box in Embodiment 1.

FIG. **2** is an enlarged perspective view showing a connection state between terminal strips and a diode in Embodiment 1.

FIG. **3** is a cross-sectional view taken along a line in FIG. **2**.

FIG. **4** is a cross-sectional view taken along a line IV-IV in FIG. **2**.

FIG. **5** is an exploded perspective view showing a terminal box in Embodiment 2.

FIG. **6** is a perspective view of a relevant part showing a connection state of terminal strips in Embodiment 2.

FIG. **7** is an explanatory diagram showing a rear face of the terminal box in Embodiment 2.

FIG. **8** is a side view of the terminal box in Embodiment 2.

FIG. **9**A is an explanatory diagram showing an action on the terminal box in Embodiment 2.

FIG. **9**B is an explanatory diagram showing an action on the terminal box in Embodiment 2.

FIG. **10** is a perspective view of a terminal box in Embodiment 3 from which a lid is removed.

FIG. **11** is a partially cutaway plan view of a main body in Embodiment 3.

FIG. **12** is a perspective view showing a connecting relationship among a terminal strip, a power cable and the like in Embodiment 3.

FIG. **13** is a cross-sectional view of the main body showing a configuration during an insertion of the power cable in Embodiment 3.

FIG. **14** is a cross-sectional view of the terminal box in Embodiment 3 in use.

FIG. **15**A is a cross-sectional view showing a positional relationship between a sealing member and an air vent in Embodiment 3.

FIG. **15**B is a cross-sectional view showing a positional relationship between a sealing member and an air vent in Embodiment 3.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

<Embodiment 1>

Hereinbelow, embodiments of the present invention will be described with reference to the drawings. FIG. **1** shows a terminal box B for a solar cell module according to the present invention. The terminal box B includes: a main body **101** made of resin; and a lid **102** made of resin for closing an opening **101***a* of the main body **101**.

The main body **101** has a pair of locking parts **101***b* integrally formed on respective lateral sides of the main body **101**. The lid **102** has a pair of claws **102***a* integrally formed on respective lateral sides of the lid **102**. By pushing the claws **102***a* of the lid **102** into the respective locking parts **101***b* of the main body **101** and allowing the claws **102***a* and the respective locking parts **101***b* to lock together, the opening **101***a* of the main body **101** is closed with the lid **102**.

Inside the main body **101**, a pair of terminal strips **106** are attached. A pair of the terminal strips **106** are configured to electrically connect a pair of respective band plate-shaped output terminals **103** of the solar cell module to a pair of respective output cables **104** connected to a storage battery or the like.

In a bottom plate **101***c* of the main body **101**, a pair of introduction holes **101***d* are formed so as to penetrate the bottom plate **101***c*. A pair of the output terminals **103** are separately introduced inside the main body **101** through the respective introduction holes **101***d*.

Each of the terminal strips **106** is formed of a conductive metal plate. As shown in FIGS. **2-4**, the terminal strip **106** includes: a terminal connection part **117** to which the output terminal **103** is electrically connected; a diode connection part **119** to which a backflow prevention diode (hereinafter, simply referred to as "diode") **118** is electrically connected; and a cable connection part **120** to which an output cable **104** is electrically connected, all integrally formed together. The terminal strip **106** is fixed to the main body **101** by locking claws **101***e* vertically arranged on the bottom plate **101***c* (see FIG. **1**).

As shown in FIG. **2**, the terminal connection part **117** includes: an approximately rectangular-shaped insertion hole **117**A into which a distal end part of the output terminal **103** is inserted; and a swingable locking piece **117**B which is formed of a piece cut and raised at one peripheral side part of the insertion hole **117**A. In addition, each of both lateral edge parts of the terminal connection part **117** is raised upward as a rib **117**C, for reinforcing the terminal connection part **117**. The rib **117**C is to be locked with the locking claw **101***e* of the main body **101**.

One example of a method for attaching the output terminal **103** to the terminal connection part **117** includes: inserting the distal end part of the output terminal **103** into the insertion hole **117**A; pushing the swingable locking piece **117**B back to the insertion hole **117**A; and compressing and fixing the output terminal **103** between an inner edge part **117***a* of the insertion hole **117**A and an edge part **117***b* on a swingable distal end side of the swingable locking piece **117**B. Further, a part of the output terminal **103** overlapping an upper face of the terminal connection part **117** may be soldered.

As shown in FIGS. **2** and **3**, each of both lateral edge parts of the diode connection part **119** is formed as a cut and raised part **119**C in a shape of a rib which is cut and raised upward. On the other hand, in a central part in a width direction of the diode connection part **119**, a protruding part **119**A is formed by protruding .a part of a face of the terminal strip **106**. Consequently, a recess **119**B is formed between the cut and raised part **119**C and the protruding part **119**A.

In addition, a pair of projections **121** are formed integrally with the cut and raised part **119**C, A distance between the projections **121** is set in such a manner that a lead wire **118***a* of the diode **118** can be fitted therebetween. As shown in FIG. **4**, by fitting the lead wire **118***a* between a pair of the projec-

tions **121** and plastically deforming a pair of the projections **121** in a direction that they come close to each other (swaging a pair of the projections **121**), the lead wire **118***a* is supported in a pinched state. The pair of the projections **121** constitute a pinching part K.

On the other hand, the lead wire **11 8***a* of the diode **118** is supported in a mounted state on the protruding part **119**A. This protruding part **119**A constitutes a supporting part S.

The diode **118** is fixed to the terminal strip **106** through a combination of the pinching and fixing by the pinching part K and the soldering in the recess **119**B. A connecting solder H in a molten state is likely to spread over the plane. However in the present invention, as shown in FIG. **3**, a position of the solder H is determined by the recess **119**B between the projection **121** and the protruding part **119**A, and thus the solder H is prevented from straying to other parts.

As shown in FIG. **2**, the cable connection part **120** is formed of a curved swaging part **120**A which is configured in such a manner that a diameter thereof can be reduced. By placing a metal core **104***a* of the output cable **104** on the swaging part **120**A and swaging the swaging part **120**A so as to surround the metal core **104***a*, the output cable **104** can be connected to the terminal strip **106** in a conduction state.

It should be noted that a rear face of the terminal box B is attached to the solar cell module with an adhesive or the like. In addition, an inner space of the terminal box B may be injected with resin for the purpose of waterproof, insulation and the like.

According to the terminal box of the present embodiment, the terminal strip **106** is provided with the recess **119**B, thus the solder H can be prevented from straying, and the diode **118** can be securely fixed to the terminal strip **106** even though the amount of the solder H is small. In addition, the lead wire **118***a* of the diode **118** supported in a mounted state by the protruding parts **119**A of the terminal strip **106** can be securely fixed to the terminal strip **106** by pinching the pinching part K and soldering the lead wire **118***a* in the recess **119**B. Further, the specific configuration described above does not require special parts and can be achieved by a simple processing on the single terminal strip **106**, and thus production costs can be reduced.

<Modifications of Embodiment 1>

Hereinbelow, modifications of the embodiment will be described.

(1) The shape and structure of the terminal box B are not limited to those illustrated in the embodiment described above. For example, the planar shape may not be a rectangular shape and may be a polygonal shape other than a rectangle, or circular shape, elliptical shape or the like. In addition, the terminal box B may be in a shape of a box without a lid.

(2) The shape and structure of the terminal strip **106** are not limited to those illustrated in the embodiment described above. For example, the protruding part **119**A or the cut and raised part **119**C may be modified. From pairs of the projections **121** of the cut and raised part **119**C positioned at both lateral edges of the terminal strip **106**, only a pair positioned on an outer side of the main body **101** may be swaged so that the lead wires **118***a* on both lateral sides of the diode **118** are pinched. Alternatively, all of the projection **121** on both lateral edges of one of the terminal strips **106** may be swaged in such a manner that one of the lead wires **118***a* is pinched. Further, from pairs on the lateral edges of the terminal strip **106**, only a pair positioned on an inner side of the main body **101** may be swaged in such a manner that one of the lead wires **118***a* of the diode **118** is pinched. Moreover, one or both of the recesses **119**B on both lateral sides of the protruding part **119**A may be soldered.

(3) In the embodiment described above, the number of the terminal strip **106** is two and the number of the diode **118** is one, but the present invention is not limited to these numbers. For example, the number of the terminal strip **106** may be three or more, and the number of the diode **118** may be two or more. These numbers may be appropriately selected while taking the volume of the solar cell module or the like into account.

<Embodiment 2>

FIG. **5** shows a terminal box B for a solar cell module according to the present invention. The terminal box B includes: a main body **201** made of resin; and a lid **202** made of resin for closing an opening **201***a* of the main body **201**.

The terminal box B is in a shape of a flat cuboid. The main body **201** has the opening **201***a*, and the opening **201***a* is closable by covering a front face part B**1** with the lid **202**. A rear face B**2** of the main body **201** is formed as an adhesive surface **207** to which an adhesive material for attaching to a solar cell module M is applicable. From among four lateral faces of the terminal box B (the main body **201**), one lateral face (first lateral face) B**3** is provided with a pair of connection parts **208** for connecting a pair of respective external cables **204**. In addition, the other lateral face (second lateral face) B**4** which is on an opposite side to the lateral face B**3** is provided with a reinforcing rib **209** which juts out and comes into contact with a surface of the solar cell module M when installed.

The main body **201** has a pair of locking parts **201***b* integrally formed on respective lateral sides of the main body **201**. The lid **202** has a pair of claws **202***a* integrally formed on respective lateral sides of the lid **202**. By pushing the claws **202***a* of the lid **202** into the respective locking parts **201***b* of the main body **201** and allowing the claws **202***a* and the respective locking parts **201***b* to lock together, the opening **201***a* of the main body **201** is closed with the lid **202**.

Inside the main body **201**, a pair of terminal strips **206** are attached. A pair of the terminal strips **206** (corresponding to terminal part) are configured to electrically connect a pair of respective band plate-shaped output terminals **203** of the solar cell module to a pair of respective output cables **204** connected to a storage battery or the like.

In a bottom plate **201***c* of the main body **201**, a pair of introduction holes **201***d* are formed so as to penetrate the bottom plate **201***c*. A pair of the output terminals **203** are separately introduced inside the main body **201** through the respective introduction holes **201***d*.

Each of the terminal strips **206** is formed of a conductive metal plate. As shown in FIG. **6**, the terminal strip **206** includes: a terminal connection part **217** to which the output terminal **203** is electrically connected; a diode connection part **219** to which a backflow prevention diode (hereinafter, simply referred to as "diode") **218** is electrically connected; and a cable connection part **220** to which a core of a cable **204** to be connected to the connection part **208** is electrically connected, all integrally formed together. The terminal strip **206** is fixed to the main body **201** by locking claws **201***e* vertically arranged on the bottom plate **201***c* (see FIG. **5**).

As shown in FIG. **6**, the terminal connection part **217** includes: an approximately rectangular-shaped insertion hole **217**A into which a distal end part of the output terminal **203** is inserted; and a swingable locking piece **217**B which is formed of a piece cut and raised at one peripheral side part of the insertion hole **217**A. In addition, each of both lateral edge parts of the terminal connection part **217** is raised upward as a rib **217**C, for reinforcing the terminal connection part **217**.

The rib **217**C is to be locked with the locking claw **201***e* of the main body **201**.

One example of a method for attaching the output terminal **203** to the terminal connection part **217** includes: inserting the distal end part of the output terminal **203** into the insertion hole **217**A; pushing the swingable locking piece **217**B back to the insertion hole **217**A; and compressing and fixing the output terminal **203** between an inner edge part **217***a* of the insertion hole **217**A and an edge part **217***b* on a swingable distal end side of the swingable locking piece **217**B. Further, a part of the output terminal **203** overlapping an upper face of the terminal connection part **217** may be soldered.

Each of both lateral edge parts of the diode connection part **219** is formed as a cut and raised part **219**C in a shape of a rib which is cut and raised upward. On the other hand, in a central part in a width direction of the diode connection part **219**, a protruding part **219**A is formed by protruding a part of a face of the terminal strip **206**. Consequently, a recess **219**B is formed between the cut and raised part **219**C and the protruding part **219**A.

In addition, a pair of projections **221** are formed integrally with the cut and raised part **219**C. A distance between the projections **221** is set in such a manner that a lead wire **218***a* of the diode **218** can be fitted therebetween. By fitting the lead wire **218***a* between a pair of the projections **221** and plastically deforming a pair of the projections **221** in a direction that they come close to each other (swaging a pair of the projections **221**), the lead wire **218***a* is supported in a pinched state.

The lead wire **218***a* is supported in a mounted state on the protruding part **219**A, and the diode **218** is attached to the terminal strip **206** through a combination of the pinching and fixing by the projection **221** and the soldering in the recess **219**B. It should be noted that an inner space of the terminal box B may be injected with resin for the purpose of waterproof, insulation and the like.

As shown in FIGS. **5** and **7**, the connection part **208** is provided with screw members **208***a*, each of which is for fixing the cable **204** to the lateral face B**3**. By connecting the core of the cable **204** to the output terminal **203** and tightening the screw member **208***a*, the cable **204** can be fixed to the lateral face B**3**.

As shown in FIGS. **7** and **8**, the adhesive surface **207** occupies a major part of the rear face B**2** of the terminal box B. By applying the adhesive material to the adhesive surface **207** and attaching the adhesive surface **207** to a predetermined position on the solar cell module M, the terminal box B can be installed. In addition, in the rear face B**2** of the terminal box B, to an edge part on a connection part **208**-side relative to the adhesive surface **207**, a double-stick tape T is attached. Likewise, to a ground part of the reinforcing rib **209** to the solar cell module M, the double-stick tape T is attached. With these two double-stick tapes T, the terminal box B is temporarily fixed to the solar cell module M, to thereby prevent a positional shift of the terminal box B until the adhesive material applied to the adhesive surface **207** exerts a satisfactory strength.

As shown in FIG. **5**, the reinforcing rib **209** includes: three vertical ribs **209***a* projecting from the lateral face B**4** of the terminal box B; and a ground plate **209***b* (corresponding to contacting part) bridged among distal end parts of the respective vertical ribs **209***a*. To the ground plate **209***b*, the double-stick tape T is attached as described above. In addition, the ground plate **209***b* is provided at a distance from the adhesive surface **207** of the main body **201**.

According to the terminal box of the present embodiment, the reinforcing rib **209** can serve as a strength member together with the main body **201**, and at the same time, the terminal box attached to the solar cell module M becomes less likely to be removed when the external force in the removing direction acts on the connection part **208**, as compared with the conventional terminal box. In addition, with the use of the double-stick tapes T, the main body **201** is temporarily fixed to the solar cell module M and thus the terminal box can be prevented from being shifted until the adhesive material exerts a strength, and therefore, the main body **201** is further securely attached. When the adhesive material is applied to the adhesive surface **207**, since the double-stick tapes T are away from the adhesive surface **207**, the application work can be performed efficiently without paying attention to the presence of the double-stick tapes T.

<Modification of Embodiment 2>

The shape, structure and number of the reinforcing rib **209** are not limited to those illustrated in the embodiment described above, and may be appropriately modified. To put it another way, any reinforcing rib **209** can be used, as long as the reinforcing rib **209** juts out integrally from the lateral face B**4**, which is on the opposite side to the connection part **208** of the main body **201**, and the presence of the reinforcing rib **209** enlarges a rotation radius when an external force P in the removing direction acts on the connection part **208**. It is a matter of course that the reinforcing rib is provided further on a lateral face other than the lateral face B**4** of the main body **201**. In this case, a reinforcing effect of the main body **201** is further enhanced. In addition, to the reinforcing rib **209**, the double-stick tape T is not necessarily attached.

In Embodiment 2 also, the modifications (1) and (3) of Embodiment 1 may be adopted.

<Embodiment 3>

FIG. **10** shows a terminal box for a solar cell module according to the present invention. The terminal box includes: a main body **301** made of resin; and a lid **302** made of resin for closing an opening **301***a* of the main body **301**. The lid **302** can close the opening **301***a* through connection holding to the main body **301** achieved by a retention mechanism.

As shown in FIGS. **10-14**, a pair of terminal strips **306** are provided inside the main body **301** of the terminal box. A pair of the terminal strips **306** and respective lead wires **310***a* of a bypass diode **310** are connected by soldering with respective solders S. A pair of band plate-shaped output cables **303** (one example of output terminal) of the solar cell module are led through respective introduction ports **301***c* of a bottom wall **301***b* of the main body **301** into the main body **301**, and the output cables **303** and the respective terminal strips **306** are connected by soldering with the respective solders S. In addition, a pair of power cables **304** are inserted through respective insertion holes **301***d* formed in the main body **301** into the main body **301**, cores **304***a* of the power cables **304** are led toward the opening **301***a* (led into the main body **301**), and the cores **304***a* are connected to the respective terminal strips **306** through swaging.

It should be noted that, for connecting the output cable **303** or the core **304***a* of the power cable **304** to the terminal strip **306**, any connection mode can be adapted, including soldering and swaging. Further, a connection may be achieved by swaging and further soldering. In this case, the connection becomes further secured.

The terminal box is adhered and attached to a rear face or the like of the solar cell module, when in use. For this purpose, electric power of the solar cell module is input through the output cable **303** of the telininal box, and output through the power cable **304**. The number of the terminal box corresponds

to the number of the solar cell modules. It should be noted that, the power cable **304** is connected to a storage battery, an inverter or the like, and the electric power is used at ordinary home, factory or the like.

<Main Body-Lid>

Referring to FIG. **11**, in the main body **301**, a pair of longitudinal walls **301***e* and a pair of transversal walls **301***f* are integrally formed so as to surround an outer periphery of the bottom wall **301***b* in an approximately square shape. In addition, outside the transversal wall **301***f* on an upper side in the drawing, a reinforcing rib **301***r* is integrally formed so as to protrude upward. The terminal box of the present invention may be used in a posture different from the posture shown in the drawing, but herein a positional relationship will be described based on a posture of the main body **301** shown in the drawing. It should be noted that from among four walls, those extending longitudinally in the drawing are referred to as "longitudinal wall **301***e*", while those extending transversally are referred to as "transversal wall **301***f*", for convenience.

From a pair of the transversal walls **301***f*, the wall on a lower side in the drawing is formed thicker, and a pair of the insertion holes **301***d* described above are formed in parallel in the transversal wall **301***f* on the lower side, so that the insertion holes **301***d* penetrate the transversal wall **301***f* in a longitudinal direction. In an outer face of the lower transversal wall **301***f* (lower face in the drawing), threaded parts **301***s* are formed and provided with respective nuts **301**N screwable with the threaded part **301***s*. When the power cable **304** is inserted into the insertion hole **301***d*, a bush **304***b* is fitted onto the power cable (see FIG. **14**), and the nut **301**N is screwed with the threaded part **301***s* to thereby tighten the threaded part **301***s*. With this configuration, the power cable **304** is supported by the main body **301** while an air tight state is achieved with the bush **304***b*.

In the bottom wall **301***b* of the main body **301**, a pair of the introduction ports **301***c* are formed as described above. In addition, in the bottom wall **301***b*, a partition wall **301***g* is formed at a position where a pair of the introduction ports **301***c* are separated. Further, in a region partitioned by the partition wall **301***g* of the bottom wall **301***b*, a terminal block **301***h* in a shape of a rib is formed. In the terminal block **301***h*, there are formed regulation pieces **301***j* for determining an engagement position of the terminal strip **306** and engaging retainers **301***k* each having a hook part for engaging and holding the terminal strip **306**. It should be noted that, each of the regulation piece **301***j* and the engaging retainer **301***k* are provided in a pair for a single terminal strip **306**, so as to engage and hold the terminal strip **306** in a sandwiching manner in a width direction.

As shown in FIGS. **11** and **13**, from among the parts of the terminal block **301***h*, especially in a part facing the insertion hole **301***d* into which the power cable **304** is inserted, an inclined face **301***t* is formed which is brought into contact with the core **304***a* of the power cable **304** (one example of the distal end part of the power cable **304**) and guides the core **304***a* in a direction away from the bottom wall **301***b* (direction toward the opening **301***a*).

Referring to FIGS. **13** and **14**, the insertion hole **301***d* is formed at a position displaced toward the opening **301***a* relative to a wall face of the bottom wall **301***b*. As a result, a step is formed between the insertion hole **301***d* and the bottom wall **301***b*. In addition, the inclined face **301***t* is formed in a region from a vicinity to the bottom wall **301***b* to a support face of the terminal strip **306** (a face brought into contact with the terminal strip **306** from among faces of the terminal block **301***h*). With this configuration, even if the core **304***a* of the power cable **304** inserted into the insertion hole is oriented toward the bottom wall **301***b*, the core **304***a* can securely come into contact with the inclined face **301***t* of the terminal block **301***h*.

As shown in FIG. **10**, the lid **302** has a pair of longitudinal sides **302***e* oriented longitudinally (in terms of the direction in FIG. **11**) and a pair of transversal sides **302***f* oriented transversally (in terms of the direction in FIG. **11**). In addition, the lid **302** has a rectangular shape which is approximately the same as the shape of the main body **301**. In an outer face of each of the longitudinal walls **301***e* of the main body **301**, a locking part **301***m* is formed. On the other hand, in each of the longitudinal sides **302***e* of the lid **302**, an arm part **302***a* is formed, and in the end part of the arm part **302***a*, a claw part **302***b* is formed. The locking part **301***m*, the arm part **302***a* and the claw part **302***b* constitute the retention mechanism described above.

With this configuration, when the lid **302** is pressed in a direction that closes the opening **301***a* of the main body **301**, the claw part **302***b* reaches an engagement state with the locking part **301***m*, and the lid **302** is retained at a closed position. Even when the claw part **302***b* is engaged with the locking part **301***m*, the lid **302** can be removed by manual operation of releasing the engagement of the claw part **302***b*.

As shown in FIGS. **14** and **15**, on an inner face side of the lid **302**, there is integrally formed a projecting wall part **302***c* which is configured to be inserted in the opening **301***a* of the main body **301** and proximate to an inner wall face of the opening **301***a*. In an outer periphery of the projecting wall part **302***c*, an annular groove **302***d* is formed. The annular groove **302***d* is provided with a ring-shaped sealing member **307** made of flexible resin.

Especially, in an inner face of the upper transversal wall **301***f* of the main body **301**, there is formed a groove-shaped air vent **308** extending from inside the main body **301** to an opening edge of the opening **301***a*. Due to this configuration, when the opening **301***a* of the main body **301** is closed with the lid **302** (the lid **302** is retained at the closed position), as shown in FIG. **15**A, the sealing member **307** supported on the lid **302** is brought into close contact with both the projecting wall part **302***c* of the lid **302** and the inner wall face of the opening **301***a* of the main body **301**, in such a manner that the sealing member **307** comes into contact with a part of the inner wall face of the opening **301***a* on a bottom wall side relative to the air vent **308**. With this configuration, rain water and dust are securely prevented from entering the terminal box.

The terminal box is attached to a rear face or the like of the solar cell module in such a manner that the reinforcing rib **301***r* and a rear face of the main body **301** are adhered to the rear face or the like of the solar cell module. In this case, when the lid **302** is retained at the closed position, an internal space of the main body **301** becomes sealed. When air inside the main body **301** expands, an internal pressure acting on the lid **302** increases. As described above, since the lid **302** is engaged with and connected to the main body **301** at portions outside the longitudinal wall **301***e*, the transversal side **302***f* on the upper side (in terms of the direction in FIG. **11**) and the transversal side **302***f* on the lower side (in terms of the direction in FIG. **11**) of the lid **302** are elastically deformed in a direction that raises the transversal side **302***f* from the main body **301**.

As described above, when the transversal side **302***f* on the upper side of the lid **302** is elastically deformed due to the increase in the internal pressure of the main body **301**, as shown in FIG. **15**B, the sealing member **307** is displaced.

When the sealing member **307** is displaced and reaches a position where the sealing member **307** overlaps the air vent **308**, the air inside is discharged through the air vent **308** outside the main body **301**. With this configuration, the internal pressure of the main body **301** is reduced and the deformation of the lid **302** is suppressed.

<Terminal Strip>

As shown in FIG. **12**, the terminal strip **306** is formed of a strip-shaped plate material made of good conductor, such as copper alloy, by press work, so as to have a configuration in which both end parts in the width direction are raised each in a shape of a rib along an entire longitudinal direction. In one end part of the terminal strip **306**, a crimp connection part **306***a* is formed for connecting the core **304***a* of the power cable **304** by swaging. In addition, at a position in the vicinity of the crimp connection part **306***a* of the terminal strip **306**, a lead wire connection part **306***b* is formed for connecting the lead wire **310***a* of the bypass diode **310**. In the other end part of the terminal strip **306**, a conductive surface **306***c* is formed for connecting the output cable **303** by the solder S. In addition, at a position next to the conductive surface **306***c* of the terminal strip **306**, there are formed an engaging hole **306***d* into which the output cable **303** is inserted, and a tongue-shaped engaging piece **306***e*. Moreover, at an intermediate part of the terminal strip **306**, there is formed a pair of regulation recesses **306***f* in each of which the regulation piece **301***j* described above is fitted. The crimp connection part **306***a* has a U-shaped cross section so that the core **304***a* of the power cable **304** is insertable. The lead wire connection part **306***b* has a pair of recesses in the respective rib-shaped parts described above for engaging the lead wire **310***a*. The conductive surface **306***c* is in a shape of a plane. The engaging piece **306***e* is cut out from a part of the plate material and raised obliquely. The formation of the engaging piece **306***e* leaves a hole region in the plate material as the engaging hole **306***d*. The regulation recess **306***f* has a configuration obtained simply by cutting out an edge end of the plate material.

When the output cable **303** and the power cable **304** are to be connected to the terminal box, the lid **302** is removed from the main body **301** and a pair of the terminal strips **306** are detached from the main body **301**, in advance.

In this state, the output cable **303** is inserted into the introduction port **301***c* of the main body **301**, and an end part thereof is inserted into the engaging hole **306***d* from an upper face side of the terminal strip **306**. By bending the engaging piece **306***e* toward the engaging hole **306***d*, the output cable **303** is compressed and retained between an inner edge portion of the engaging hole **306***d* and the engaging piece **306***e*. Further, .a part near a distal end of the output cable **303** is connected and fixed to the conductive surface **306***c* of an upper face of the terminal strip **306** with the solder S, to thereby make them electrically conductive.

With the core **304***a* being exposed by removing a coating on the end part of the power cable **304**, the power cable **304** is inserted through the insertion hole **301***d* of the main body **301**. During this insertion, as shown in FIG. **13**, the core **304***a* of the power cable **304** comes into contact with the inclined face **301***t* of the terminal block **301***h*, and the core **304***a* is guided toward the opening **301***a*. With this configuration, a bundle in the core **304***a* can be inserted without being disturbed (without being unraveled). The inserted power cable **304** is then pulled out, the core **304***a* of the power cable **304** is pressed against the crimp connection part **306***a* of the terminal strip **306**, to thereby make them electrically conductive.

As descried above, the work order for connecting the output cable **303** and connecting the power cable **304** to the terminal strip **306** is not determined, and any connection can be performed first.

Next, the terminal strip **306** to which the output cable **303** and the power cable **304** are connected as described above is held in engagement with the engaging retainer **301***k* of the main body **301**. Upon this engagement holding, the regulation pieces **301***j* of the main body **301** are fitted into the respective regulation recesses **306***f* of the terminal strip **306** to thereby determine the position of the terminal strip **306**, and the terminal strip **306** is pushed into towards the bottom wall **301***b*. With this configuration, the terminal strip **306** is allowed to be pushed into while a pair of the engaging retainers **301***k* are elastically deformed, and hook parts of the engaging retainer **301***k* reach a state in which the terminal strip **306** is held, to complete a holding action of the terminal strip **306**.

After the holding action of a pair of the terminal strips **306** is completed, a pair of the lead wires **310***a* of the bypass diode **310** are placed in the lead wire connection parts **306***b* of the respective terminal strips **306** and soldered with the solder S, to thereby electrically connect a pair of the lead wires **310***a* to a pair of the terminal strips **306**. It should be noted that the soldering of a pair of the lead wires **310***a* to the lead wire connection part **306***b* of the terminal strip **306** as described above may be performed before the terminal strip **306** is engaged with the main body **301**. In addition, the end part of the output cable **303** may be soldered to the conductive surface **306***c* of the terminal strip **306** after the terminal strip **306** is held in engagement with the main body **301**.

Subsequently, the lid **302** is set so as to close the opening **301***a* of the main body **301**. Consequently, the sealing member **307** supported on the lid **302** is brought into close contact with both the projecting wall part **302***c* of the lid **302** and the inner wall face of the opening **301***a* of the main body **301**, and the inside of the terminal box reaches a sealed state. Then, the terminal box in this state is adhered to the rear face or the like of the solar cell module, and the work process is completed.

<Modifications of Embodiment 3>

The present invention may be configured in the following manners other than the embodiments described above.

(1) The present invention may be applied to a terminal box having three or more terminal strips **306**. In this case, the number of the power cables **304** inserted into the terminal box may be two or more. In this case, the inclined face **301***t* is formed in the terminal block **301***h* for supporting the terminal strip **306** corresponding to the power cable **304**.

(2) For supporting the terminal strip **306** on the main body **301**, the terminal strip **306** may be fixed by tightening a screw.

<Further Modifications of Embodiment 3>

(1) The air vent **308** may be formed in the transversal wall **301***f* on the lower side in FIG. **11**. In this case, the air vent **308** may be formed also in the transversal wall **301***f* on the upper side. Especially in the present invention, a plurality of the air vents **308** may be formed in the transversal wall **301***f*.

(2) The retention mechanism may be configured in such a manner that a lid is pulled and retained at the closed position by a spring or the like. With this configuration, when the internal pressure is increased, the entire lid can be displaced. In this case, air can be discharged due to this

displacement, and after the pressure is decreased, the lid can be retained at the closed position by the spring biasing force.

(3) In a case where the retention mechanism is constituted using the spring, each side of the lid may be provided with the retention mechanism. A biasing force of one of the springs of the retention mechanisms is set lower than the spring biasing forces of the other retention mechanisms, and the groove-shaped air vent is formed in an inner wall of the opening at a position where the retention mechanism with the lower spring biasing force is provided. Due to this configuration, a part of the lid (a portion where the spring biasing force is low) is easily displaced, and thus the discharge of air can be performed at a specific position when the internal pressure is increased.

It should be noted that, as described above, the reference characters are used for convenience of reference to the attached drawings. However, it should not be construed that the designation by the reference characters limits the present invention to the configurations of the attached drawings. Needless to say, the present invention can be carried out in various embodiments without departing from the spirit and scope of the present invention.

What is claimed is:

1. A terminal box comprising:

a main body;

at least one pair of terminal strips which are connectable to a positive electrode and a negative electrode of a solar cell module; and

a backflow prevention diode bridged between the terminal strips to connect the terminal strips;

wherein

the terminal strips and the backflow prevention diode are contained in the main body, and

the terminal strip comprises:

a supporting part for supporting a lead wire of the backflow prevention diode in a mounted state;

a pinching part for supporting the lead wire in a pinched state; and

a recess which is provided between the supporting part and the pinching part and configured to position a connecting solder upon connecting the lead wire and the terminal strip.

2. The terminal box according to claim **1**, wherein

the terminal strip is formed of a metal plate,

the supporting part is formed of a protruding part which protrudes from a part of a face of the terminal strip, and

the pinching part is formed of a pair of cut and raised parts each formed by cutting and raising an edge part of the terminal strip.

* * * * *